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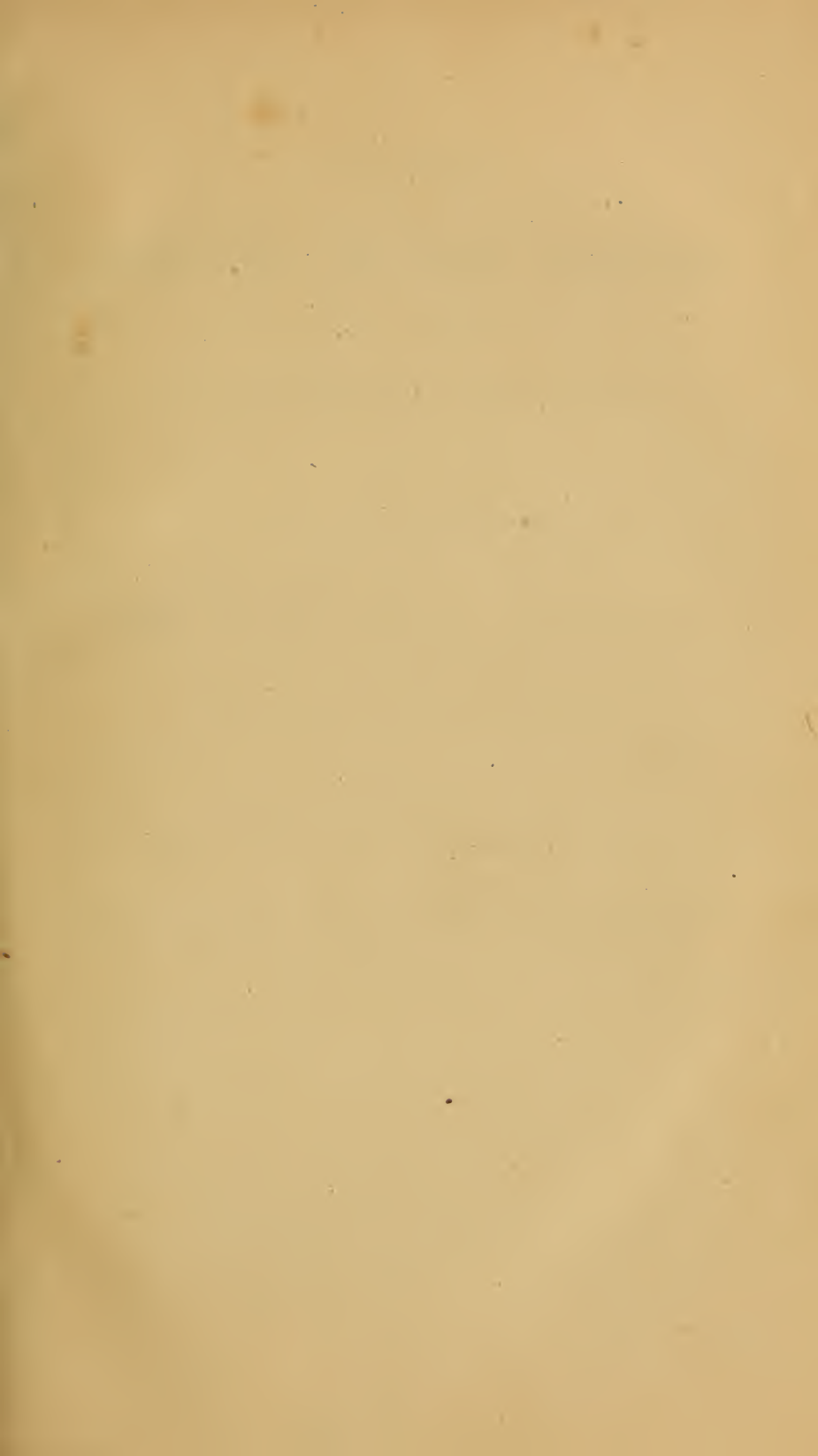
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CHRONIC
DISEASES OF THE LARYNX,

WITH SPECIAL REFERENCE TO

LARYNGOSCOPIC DIAGNOSIS

AND

LOCAL THERAPEUTICS.

BY

DR. ADELBERT TOBOLD,

LECTURER IN THE UNIVERSITY OF BERLIN.

TRANSLATED FROM THE GERMAN AND EDITED

BY

GEORGE M. BEARD, A. M., M. D.,

LECTURER ON NERVOUS DISEASES IN THE UNIVERSITY OF NEW YORK.

WITH AN INTRODUCTION ON THE HISTORY AND ART OF LARYNGOSCOPY AND
RHINOSCOPY, RHINITIS, INHALATIONS, AND ELECTRIZATION APPLIED
TO DISEASES OF THE AIR-PASSAGES; AND AN APPENDIX
BY THE EDITOR.

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TO
PROFESSOR LEONARD J. SANFORD, M. D.,
OF
YALE COLLEGE,

WHO WAS THE FIRST IN THE PROFESSION

TO GIVE ME

COUNSEL AND ENCOURAGEMENT IN THE SPECIAL STUDIES OF MY LIFE ;

AND WHO, AMID THE DEMANDS OF VARIOUS PRACTICE,

HAS YET CULTIVATED

THE IMPORTANT DEPARTMENT OF LARYNGOLOGY,

THIS TRANSLATION IS RESPECTFULLY

DEDICATED,

BY HIS FRIEND AND FORMER PUPIL,

GEORGE M. BEARD.

CONTENTS

INTRODUCTION

CHAPTER I.

	PAGE
HISTORY OF LARYNGOSCOPY	1
Levret; Bozzini, Frankfort-on-the-Maine; Dr. Senn, of Geneva; Babington, Bennati, of Paris; Baumès, of Lyons; Liston, A. Warden, Avery, of London; Garcia, Türk, of Vienna; Czermak, epitome.	

CHAPTER II.

DESCRIPTION OF THE APPARATUS	5
Artificial light, Tobold's apparatus for illumination, the laryngeal mirror, difficulties.	

CHAPTER III.

METHOD OF CONDUCTING A LARYNGOSCOPIC EXAMINATION	12
Arrangement of the apparatus, position of the patient, position of the examiner, adaptation of the light, holding the tongue, introduction of the mirror.	

CHAPTER IV.

THE LARYNGEAL IMAGE	19
-------------------------------	----

CHAPTER V.

AUTO-LARYNGOSCOPY	22
Laryngeal syringe, laryngeal holder, solutions, powders, solids, brushes, and sponges.	

CHAPTER VI.

APPLICATION OF REMEDIES TO THE LARYNX UNDER THE GUIDANCE OF THE LARYNGOSCOPE	23
--	----

CHAPTER VII.

INFRA-GLOTTISCOPY	PAGE 27
Dr. Neudörfer, Czermak, Von Bruns, magnifying instruments, Dr. Wertheim, Türk, Voltolini.	

CHAPTER VIII.

RHINOSCOPY	29
Bozzini, Baumés, Avery, Czermak, instruments required, Spatulas, palate hooks, method of conducting a rhinoscopic examination, image in the rhinal mirror.	

CHAPTER IX.

RHINITIS.

(CATARRH, NASO-PHARYNGEAL CATARRH, CORYZA, BLENNORRHOEA)	35
Nomenclature, reasons for preferring the term Rhinitis; frequency of this disease, causes, confinement in over-heated rooms, exposure to night air, smoking, hot drinks; symptoms: sneezing, feeling of dryness and heat, cœzena, prognosis. Treatment, anatomy of the nasal passages, cleansing remedies, mild astringents, inhalations, Thudicum's method, electricity.	

CHAPTER X.

INHALATIONS	52
Recent history of this method of treatment, Sales-Girons, Bergson, Siegle, apparatus, rules to be observed in the employment of inhalations, doses of the substances used, therapeutic value of inhalations.	

CHAPTER XI.

GENERAL, PARTIAL AND LOCALIZED ELECTRIZATION IN DISEASES OF THE AIR-PASSAGES	62
Personal experience of the editor and Dr. A. D. Rockwell, apparatus of Jerome Kidder. General electrization, tonic effects. Partial electrization and localized electrization.	

CHRONIC DISEASES OF THE LARYNX.

INTRODUCTION	75
On the possibility under all circumstances of making an exact laryngoscopic diagnosis. Foundation principles of Laryngoscopy.	

CONTENTS.

vii

SECTION I.

HISTOLOGY AND PHYSIOLOGY.

	PAGE
CARTILAGES AND LIGAMENTS OF THE LARYNX	79
Lamina Intermedia. Mucous membrane and glands of the larynx. Physiological phenomena of the formation of the Voice with reference to the alterations dependent on pathological changes. Larynx compared with musical instruments. Formation of the voice dependent on four main points.	

SECTION II.

Diseases of the mucous membrane and of the partially affected sub-mucous tissue. Nomenclature of the author.

LARYNGITIS CHRONICA SIMPLEX	91
Anatomico-pathological appearance, symptoms and course, tendency of relapse of mucous membranes that have been diseased. Etiology, hot drinks, elongated uvula, laryngoscopic diagnosis, prognosis, therapeutics. General dietetic management, "clergy-men's sore throat," smoking tobacco, medical treatment, uselessness of gargles, local treatment, touching with a sponge. Nitrate of silver, tannic acid, nitrate of silver the best of all its substitutes, inhalations useless.	

SECTION III.

SECONDARY FORMS OF INFLAMMATION AND ULCERATIVE PROCESSES—PROMINENT AFFECTION OF THE SUB-MUCOUS TISSUE.

CHRONIC ULCERATIVE LARYNGITIS	109
Anatomico-pathological appearance, symptoms and course, etiology, laryngoscopic diagnosis, prognosis, therapeutics.	

INFLAMMATION AND ULCERATIVE PROCESSES IN OTHER PARTS OF THE LARYNX	113
--	-----

Epiglottis, ary-epiglottic ligaments or folds, ventricular bands, vocal cords, posterior wall of the larynx, arytenoid cartilages, anæmia of the mucous membrane of the larynx.

LARYNGITIS TUBERCULOSA OR PHTHISIS LARYNGEALIS	120
Anatomico-pathological appearance, symptoms and course. Etiology, the effect of general constitutional tuberculosis, laryngoscopic diagnosis, first, second and third stages; prognosis unfavorable, cure sometimes observed. Therapeutics: tonic regimen, residence in a mild, moist climate, touching the larynx.	

	PAGE
LARYNGITIS SYPHILITICA, SIMPLEX ET ULCEROSA	132
Anatomico-pathological appearance, symptoms and course, etiology, laryngoscopic diagnosis, prognosis, therapeutics.	
EDEMA OF THE LARYNX	138
Anatomico-pathological appearance, symptoms and course, narrowing of the larynx, dyspnœa, etiology, more frequent in adults, general diagnosis, laryngoscopic diagnosis, prognosis unfavorable, therapeutics, derivatives and scarification.	
ABSCESS OF THE LARYNX	150
Symptoms and course, etiology, laryngoscopic diagnosis, prognosis, therapeutics, emetics.	

SECTION IV.

DISEASES OF THE PERICHONDRIUM AND THE CARTILAGE.

<i>Perichondritis and Chondritis laryngea</i>	155
Anatomico pathological appearance, symptoms and course, etiology, diagnosis, therapeutics, touching the cavity of the larynx with nitrate of silver.	

SECTION V.

DISEASES OF THE NERVES OF THE LARYNX.

DISEASES of the nerves of sensation, spasmodic coughs, and nervous pains of the Larynx	163
Anæmia of the mucous membrane the <i>causa efficiens</i> , symptoms, usually in women, prognosis generally favorable, therapeutics, touching with the sponge, use of the constant current of electricity, subcutaneous injections of morphia, general electrization, anæmia.	

DISEASES OF THE NERVES OF MOTION.

SPASMUS GLOTTIDIS	166
Symptoms and course, peculiar to early life, in adults the course is chronic, etiology, dentition, hereditary transmission, bad nutrition, impure air, and damp months of winter, psychical affections, softening of the brain, reflex symptoms, diagnosis, prognosis, therapeutics, to combat the spasms, internal remedies, prophylaxis, residence, use of constant current, striking case reported.	
PARALYSIS OF THE MUSCLES OF THE GLOTTIS	177
Anatomy and physiology of the larynx, different kinds of paralysis, symptoms and course, uncertain basis for a diagnosis,	

CONTENTS.

ix

PAGE

hysterical aphonia. Etiology, local diseases of the larynx, disturbances of the nutrition of the vagus or of its branches, constitutional diseases, intoxication, affections of the nervous centres, hysteria, taking cold, rheumatism, mechanical causes. Laryngoscopic diagnosis, different forms of paralysis represented by cuts, prognosis, therapeutics, electrization, method of application, constant current compared with the induced. Case reported by Dr. F. I. Knight.

SECTION VI.

ANOMALIES in the shape of the Larynx 194

Widening of the laryngeal cavity, pressure from tumors, hypertrophy of the glands of the thyroid cartilage, hyperostosis, exostosis and ecchondrosis, tumors on the surface, cedema, catheterization.

SECTION VII.

FOREIGN BODIES IN THE LARYNX 196

Anatomico-pathological appearance, symptoms, course, influence of imagination, singular cases reported. Etiology, physiology of swallowing, "swallowing the wrong way," diagnosis, subjective feelings, prognosis, therapeutics, use of the finger, tracheotomy, use of forceps.

SECTION VIII.

NEOPLASMS IN THE LARYNX 205

Anatomico-pathological appearances, nomenclature, papillary tumors, papillomata, condylomata, simple, berry like and villous . 207

1 Cellular tumors, carcinoma, epithelial form (canceroid) medullary form (encephaloid). 208

2 Epithelial cancer (canceroid), epithelial (canceroid) epithelioma.

3 Medullary cancer, carcinoma, medullary (encephaloid).

4 Mucous Polypi.

5 Fatty Tumors, Lipomata.

SYMPTOMS AND COURSE 212

Hoarseness and aphonia, abnormal harassing sensitiveness in the throat, difficulties of breathing.

ETIOLOGY 216

DIAGNOSIS 217

fibromata, papillomata, epithelial cancer encephaloid, encysted tumors containing colloid substances.

	PAGE
PROGNOSIS	224
more favorable since the introduction of the laryngoscope, fibromata and lipomata, carcinomata.	
THERAPEUTICS	225
Internal medication fruitless, operative procedures necessary.	
GENERAL PRELIMINARY CONDITIONS AND REQUIREMENTS FOR LARYNGOSCOPIC OPERATIONS	227
The patient, the operator, description of phantom for preliminary practice. <i>Instrumental apparatus</i> . Simplicity, holding the epiglottis, irritability, anæsthetizing the larynx. Special preparations. Laryngoscopic operations. Laryngoscopic position,	231
SPECIAL METHODS OF OPERATION	235
1 EXTIRPATION, CRUSHING TO PIECES, PUNCTURING.	
2 CRUSHING WITH FORCEPS AND PINCETTE-LIKE INSTRUMENTS	242
3 EXTIRPATION BY A NOOSE	243
4 GALVANO-CAUSTIC	245
5 CAUTERIZATION	247
(a) Application of solid cauterizing agents, nitrate of silver and chromic acid.	
(b) Application of fluid cauterizing agents.	

SUPPLEMENT.

EXTRA-LARYNGEAL METHODS OF OPERATION	254
--	-----

APPENDIX.

Lawson's Caustic applicator. Mackenzie's Laryngeal Galvanizer. Tobold's Brush, Tobold's Canula and small mirror for infra-glottiscopy. Lewin's Pulverisateur, Apparatus for Galvanic current, German student Lamp. Anatomy of Soft Palate uvula and Pharynx.

EDITOR'S PREFACE.

The task of translating this treatise of one of the most distinguished German laryngologists, and of presenting it in this form, with extended additions, was undertaken in order to supply a need that has been so long and so widely felt, of some single work that should treat, in a measure exhaustively, of the Chronic Diseases of the Larynx, and of the ordinary inflammations of the nasal passages, and also explain, in a succinct manner, the art of diagnosing these affections with the aid of Laryngoscopy and Rhinoscopy.

The work of Dr. Tobold was selected from all others because it was believed to contain more that was at once instructive and practical, on the subject of which it treats, than any other treatise that has ever appeared on the subject.

The writings of Dr. Horace Green were useful in their day and under the old dispensation, but are manifestly as out of place in our time as would be the almanacs that were prepared at the same period. It will be observed, however, that whatever was good and true in the system of Green, Trousseau, and Belloc has not been discarded, but has been retained and improved upon since the popularization of the laryngoscope.

Treatises on Laryngoscopy and Rhinoscopy, have been multiplied almost without number. Most of these served well their purpose to enliven the interest of the profession in the

infancy of the laryngoscopic and rhinoscopic arts; but the need for them, that existed a few years ago, has now fully gone by, and they may pass into history.

There have also been a number of works on the various affections of the larynx. The most important of these is that of Dr. Türk, which, although very thorough and exhaustive, is yet so entirely Germanesque in its character that it could not possibly be adapted to the wants of the great mass of American practitioners.

In the preparation of this volume, I have ever kept in mind these three leading aims.

1. To *include* all that is of direct and practical importance on the subjects here discussed.

2. To *exclude* all that would be in any way superfluous, or that would tend to bewilder or dishearten the student, who should approach the department of Laryngology *ab initio*.

3. To make the work in its totality a practical, and, so far as possible, an exhaustive compound of the best experience of the profession on the subjects of which it treats, and thus to obviate the necessity, heretofore experienced, of consulting a large number of separate and distinct treatises, in order to understand the present state of our knowledge of the anatomy, physiology, pathology, laryngoscopic and rhinoscopic diagnosis, and various systems of treatment of the chronic affections of the larynx, pharynx, and nasal passages.

In the chapters devoted to Laryngoscopy and Rhinoscopy, I have studied, above all, brevity, simplicity, and clearness. I have only described the forms of apparatus that I regard as the best, and have tried to lay down no rules that are in any degree superfluous.

The subject of Rhinitis was treated of in considerable detail because, although it is one of the most common diseases of our northern climate, and is as relievable as are analogous

affections in other parts of the body, it has yet never been treated of, on scientific principles, in the permanent literature of any language.

It is now universally conceded by aurists of the modern school, that the various inflammations of the middle ear, which are the most frequent causes of deafness, are usually the consequences of analogous affections in the pharynx, nasopharyngeal space, and nasal passages, and must be treated accordingly. This fact makes it particularly important that the subject of rhinitis should now be thoroughly understood.

It is hoped that what is here said, unsatisfactory as it may be, may have the effect of reminding at least some in the profession that, to neglect the logical study and treatment of this very common, and very annoying affection, and thus to compel our patients to betake themselves in despair to ignorant and unprincipled vampires, is a blunder that is almost a crime.

Those who wish to investigate the subject of inhalations in greater detail than I have thought best to present it, are referred to the recently published work of Dr. J. Solis Cohen, as by far the best treatise that has yet appeared on this yet undeveloped theme.

The constitutional tonic effects of general electrization with the Faradaic current have been so long recognized by the few in the profession who have had opportunity to judge of it by personal observation, and they have been so strikingly corroborated by other observers since the publication of the treatise on *The Medical Use of Electricity* by Dr. A. D. Rockwell and myself, and, moreover, have been found in my experience of such great efficacy in the treatment of diseases of the air-passages, dependent on or associated with general debility, that I have described the *modus operandi* of this branch of electro-therapeutics with as much detail as was consistent with the scope of the work.

I earnestly recommend general electrization to the profession as a powerful adjuvant in the treatment of the diseases of mucous membranes, for any who have the time and the will to undergo the preliminary study and experience that is requisite for its successful employment.

In devoting so large a portion of the book to the Editor's Introduction, I am aware that I have laid myself open to criticism, but this somewhat anomalous procedure will be more than justified if the work, in its entirety, shall fill the niche for which it was designed, and meet the wants of the great body of practitioners.

As the work now stands, including the Introduction, the Translation, and the Appendix, it embraces the following themes :

1. The minute and practical anatomy of the Uvula, Soft Palate, Pharynx, and Larynx.
2. Physiology of the voice.
3. History and art of Laryngoscopy and Rhinoscopy.
4. *Résumé* of the system of treatment by Inhalation.
5. Rhinitis.
6. Modus operandi of General, Partial, and Localized Electrization, with the indications for their employment in diseases of the air passages.
7. Chronic Diseases of the Larynx, their Etiology, Symptomatology, Pathology, Laryngoscopic Diagnosis, and Medical and Surgical Treatment.

In the preparation of the Introduction, I have made very free use of the *Lehrbuch der Laryngoscopie* of Dr. Tobold, and have also drawn upon it very largely for illustrative cuts.

I have also consulted the writings of Czermak, Türck, Semmeler (Caswell's Translation), Gibb, Mackenzie, and the treatises of Lewin, Beigel, and DaCosta on Inhalations ; and

to these works, those who desire to investigate the respective subjects in greater detail are referred.

In the translation, my leading idea has been to render the thoughts of the author in as clear and readable English as was possible, and by this standard I desire to be judged.

Throughout the work the author uses Latin and English nomenclature interchangeably, and, where there was no possibility of confounding different diseases, I have not thought best to deviate from the original in this respect.

The few additions that I have interspersed in the text are included in brackets.

In conclusion, I desire to express my particular acknowledgment to Dr. A. Ruppaner, whose interesting demonstrations and instructions first inspired and aided me in the special study of Laryngology. I desire also to express my obligations to Messrs. Otto & Rynders, for politely furnishing me with a number of cuts, with which the work is illustrated.

NEW YORK, 914 Broadway,

December 1st, 1867.

GEORGE M. BEARD.

AUTHOR'S PREFACE.

In few departments of medicine has there been wrought in recent times a more complete revolution than in that of the Pathology and Therapeutics of diseases of the Larynx.

Since the introduction of Laryngoscopy among our methods of diagnosis, and its development into a complete art, not only has the diagnosis of this form of disease attained a certainty not before known, but its therapeutics also have reached such a grade of certainty and positiveness that the feasible application of remedies to the parts concerned, under the guidance of the laryngoscope, is limited only by their accessibility.

It, therefore, must appear all the more strange that the diagnostic and therapeutic results, achieved by means of the laryngoscope, have received but a very unsatisfactory attention, not only in the larger text books of recent date, but also in the monographs that are devoted to laryngeal affections, and which, in other respects, leave nothing to be wished for.

In these works this most important agent in the diagnosis and treatment of diseases of the larynx is not regarded as the basis of this department of pathology, but at least finds only a superficial and incidental mention among the diagnostic aids.

In view of this manifest incongruity, that may be regarded as a crying evil, I may very properly be allowed to present a new monograph on the diseases of the larynx, based on laryngoscopic diagnosis and therapeutics.

During a number of years, employed particularly in this speciality, I have been enabled to collect together a large clinical material, from which, as I hope, I have educed results that are not unimportant.

And it may be the more proper for me to offer this as a sufficient basis for such a labor, inasmuch as at the same time I have taken great pains to collect and present all observations pertaining to this department both from ancient and modern literature.

I have made special effort in this presentation, so far as possible, to bring the physiological appearances of the affected organs in accord with the pathological conditions and therapeutic facts. But particularly was I anxious to set forth the morbid appearances with the most accurate distinctness and precision, and to place their characteristics in the foreground, without allowing the volume of the work to increase to a useless size by a tedious casuistry, which often tends more to bewilder than to elucidate. May this contribution that I herewith present to the medical public, win new disciples for *local diagnosis*, and, as a direct consequence, new results for *local therapeutics*.

DR. A. TOBOLD.

BERLIN, April, 1866.

JUST PUBLISHED

THE MEDICAL USE OF ELECTRICITY;

WITH SPECIAL REFERENCE TO

GENERAL ELECTRIZATION

AS A TONIC IN

*Neuralgia, Rheumatism, Dyspepsia, Chorea,
Paralysis, and Other Affections Asso-
ciated with General Debility.*

WITH ILLUSTRATIVE CASES.

BY

GEORGE M. BEARD, A.M., M.D.,

LECTURER ON NERVOUS DISEASES IN THE UNIVERSITY MEDICAL COLLEGE,

AND

A. D. ROCKWELL, M. D.

We can say no more than that it seems to be the entering wedge toward the more thorough laying open of the important subject of which it treats. * * *

The causes of the ill success of physicians in using electricity, are very graphically given. The gist of it is, that physicians often, like the laity, expect means of cure to act in a miraculous sort of a way, and not as a result of their careful and conscientious use, in the hands or under the immediate observation of the medical attendant. * * *

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"It is due to our patients that this, to them at least, very important branch of medical science should not be so outrageously neglected: and we hope that the profession, before passing judgment upon electricity as a therapeutical agent, will try it as thoroughly and faithfully as we know these gentlemen have done."—*Boston Medical and Surgical Journal.*

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INTRODUCTION.

CHAPTER I.

HISTORY OF LARYNGOSCOPY.

THE use of specula for the examination of the canals of the body appears to have been of quite ancient origin, but it is probable that they were not employed to any great extent, nor regarded as of special therapeutical value.

To examine a part situated at an angle to the line of vision, there must needs be something more than an ordinary speculum. There must be strong illumination and reflection, and the difficulty of properly combining these two was the cause of the delay of the scientific world in its progress toward laryngoscopy.

A little before the middle of the last century, Levret, a French accoucheur of distinction, employed specula of different kinds in the mouth for the purpose of aiding him in the removal of polypoid growths from the nostrils and throat. His instrument consisted mainly of a polished metal which "reflected the luminous rays in the direction of the tumor, and at the same time received the image of the tumor on its reflecting surface."

Nothing more was heard of the subject until Bozzini, of Frankfort-on-the-Main, invented an apparatus for illuminating various canals of the body. His first work was published in 1807. It was entitled "The Light-Conductor; or Description of a Simple Apparatus for the Illumination of the Internal Cavities and Spaces in the living Animal Body."

This work met with the usual fate of innovations in science, and Bozzini was made the object of reproach and persecution. It was alleged that he professed to be able to inspect the internal viscera. The Faculty of Vienna reported unfavorably to his invention, declaring that it could never be made of practical service. But from the descriptions of his apparatus that have come down to us, it is evident that Bozzini anticipated nearly all of the general principles of laryngoscopy as they obtain at the present day. He used a kind of lantern for illumination, and a number of specula of various shapes. The specula were divided by a vertical partition, thus making two canals, in each of which there was a mirror. One of these mirrors conveyed the light; the other received the image.

In 1827, Dr. Senn, of Geneva, made some experiments with a laryngeal mirror, but secured no very decided results. His first publication was not presented until 1829.

In 1829, Dr. Benjamin Guy Babbington, F. R. S., exhibited a laryngoscope before the Hunterian Society of London. It consisted of an oblong piece of looking-glass, set in silver wire, with a long shank. It was proposed to call it a "glottoscope." He is rightly regarded as the inventor of the laryngoscope; for he employed two mirrors, one for receiving the image, the other for concentrating the solar rays on the first.

The patient sat with his back to the sun, holding the illuminating glass with the left hand, while he introduced the laryngeal mirror with the right. A spatula for depressing the tongue was connected with the mirror by a spring.

With the laryngoscope of the present day, artificial light is employed for illumination, and the rays are reflected into the larynx by a circular mirror attached to the head of the operator. In these respects only, does it differ from the laryngoscope of Dr. Babbington.

In 1832, Dr. Bennati, of Paris, announced that he could see the vocal cords with a mirror and speculum invented by a mechanic named Selligue.

In 1838, Baumès, of Lyons, called the attention of the profession of that city to a mirror that he had devised for examining the throat and posterior nares.

In 1840, Liston reported that he had been accustomed to examine the throat for suspected tumors by means of a mirror dipped in hot water.

In 1844, Dr. A. Warden, employed a prism with which he succeeded in inspecting the glottis, in two cases.

In 1844, also, Mr. Avery, of London, began a series of experiments that resulted in the invention of an apparatus very closely resembling the laryngoscope of the present day.

He used artificial light. He concentrated the rays on the laryngeal mirror, by means of a large, circular, perforated reflector. The mirror was placed at the end of the speculum.

In his method of concentrating the rays he anticipated Czermak; but artificial light had been used by Bozzini many years previous.

In 1855, Professor Manuel Garcia presented to the Royal Society of London the results of some experiments that he had made with auto-laryngoscopy in studying the mechanism of the human voice. His method (which he supposed had never been attempted before) was to introduce a small mirror into the pharynx, while a second mirror received the rays of the sun, and directed them on the first.

This communication was not very enthusiastically received, at the time, and would have been entirely forgotten but for the splendid researches of Czermak, shortly after.

In 1857, Dr. Türck, Physician-in-Chief to the General Hospital of Vienna, began to experiment with the laryngeal mirror on the patients under his charge. As he trusted entirely to solar rays, and used no apparatus for concentrating the light, he necessarily met with ill success. Accordingly, he threw aside his mirrors in temporary disgust, still intending, however, to pursue his investigations at some future time. He afterwards continued to experiment spasmodically, as best he could, with the uncertain sunlight of a German winter. In the fall of 1857, he lent his mirrors to Professor Czermak, who at once commenced a series of investigations and experiments that were crowned with brilliant success. For the rays of the sun he substituted artificial light. For concentrating the light he

used a large ophthalmoscopic mirror, and dispensed with the hinge that united the laryngeal mirror to its stem.

Czermak's first essay, entitled "Physiological Researches with the Laryngeal Mirror of Garcia," was published in 1858, and was followed, in April, by a paper before the Academy of Sciences of Vienna.

Czermak's first experiments were made on his own larynx; and his subsequent demonstrations, by which he so astonished the medical world, owed their success to the experience thereby gained. Moreover, he had unusual physical advantages for a self-demonstrator. His pharynx and larynx were both large, and his tonsils and uvula were quite small; so that he seemed to have been born an auto-laryngoscopist.

After Czermak had thus demonstrated the easy possibility of laryngoscopy, Professor Türck returned to his investigations, with increased enthusiasm, and labored with great zeal and assiduity. He made many improvements and suggestions, and brought laryngoscopy into the service of therapeutics.

Since that time, the subject has been thoroughly worked up, by very many able men in France, England, and Germany, until it has become thoroughly recognized by all medical men everywhere, as an indispensable adjuvant in the treatment of laryngeal diseases.

In glancing over this epitome of the history of the invention of laryngoscopy, these facts seem to be incontrovertible :

1. Babbington first discovered laryngoscopy, and first applied it.

2. Garcia was the first to practise auto-laryngoscopy.

3. Türck revived the subject after it had been a long time forgotten.

4. Czermak complemented the labors of Türck, made laryngoscopy convenient as well as possible, and by his enthusiasm and perseverance forced the subject on the medical public.

5. Czermak and Türck may rightly divide the honor of having introduced laryngoscopy into practice. The French Imperial Institute justly recognized the merits of both, by dividing the prize between them.

CHAPTER II.

DESCRIPTION OF THE APPARATUS.

DURING all the investigations that have been made on this subject, various methods of illuminating have been employed, and even at the present day there is no uniformity among the laryngoscopists of different countries.

Sunlight answers the purpose very well, where it can be obtained, but in this country and in England there are so many cloudy days, that laryngoscopy would be practically almost impossible for those who should depend on the clear shining of the sun. Moreover, those who use the sunlight for examining the throat must have an office in a part of the house accessible, for a good portion of the day, to the direct rays of the sun. This necessity, of course, entails great inconvenience.

A laryngoscopic examination can be made without any reflector at all, by throwing a strong light directly on the laryngeal mirror; but this method is neither convenient nor satisfactory.

The first great requisite for successful laryngoscopy is a powerful and constant artificial light.

I cannot agree with those who think that any kind of a lamp will answer the purpose of illumination. What the concave mirror is to aural surgery, what the lenses are to microscopy, such is the illuminating apparatus for the laryngoscopist.

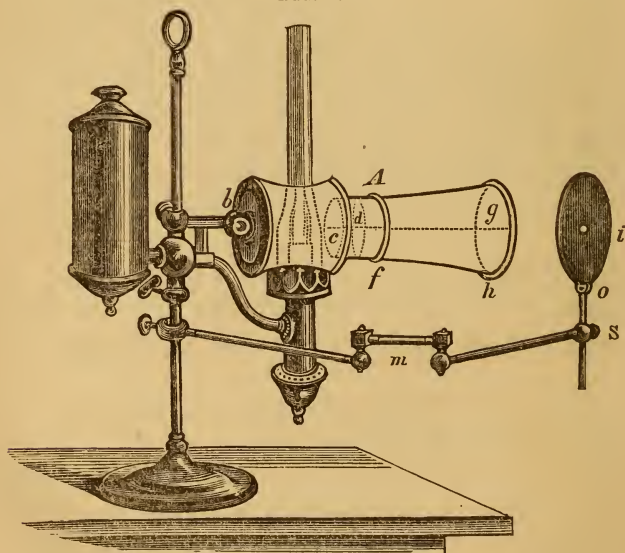
It is true that with an ordinary lamp the glottis can be readily seen; but it is one thing to gain a superficial view of the parts, merely for the gratification of the curiosity, and quite

another to minutely inspect each separate portion of the vocal apparatus, making an accurate diagnosis of the nature and extent of any morbid process that may be present. Furthermore, it is conclusive that, in all operative procedures in the larynx, as well as in making the ordinary local applications, there is need of the very best illumination that can be obtained.

Nor is this all: the light should be, in a measure, uniform. The examiner should, so far as possible, become accustomed to the use of one kind or degree of light, in all his investigations. The apparatus should also be one that can be readily adjusted for different lights.

These conditions are very fully met in the apparatus of Dr. Tobold, as described by him in his "Lehrbuch der Laryngoscopie" (Text-Book of Laryngoscopy.)

FIG. 1.



TOBOLD'S APPARATUS FOR ILLUMINATION.

Two powerful convex glasses (*c* and *d*) of equal refraction, are fastened in a brass tube, one before the other, close to the cylinder of a lamp. A ring separates them one line apart, so

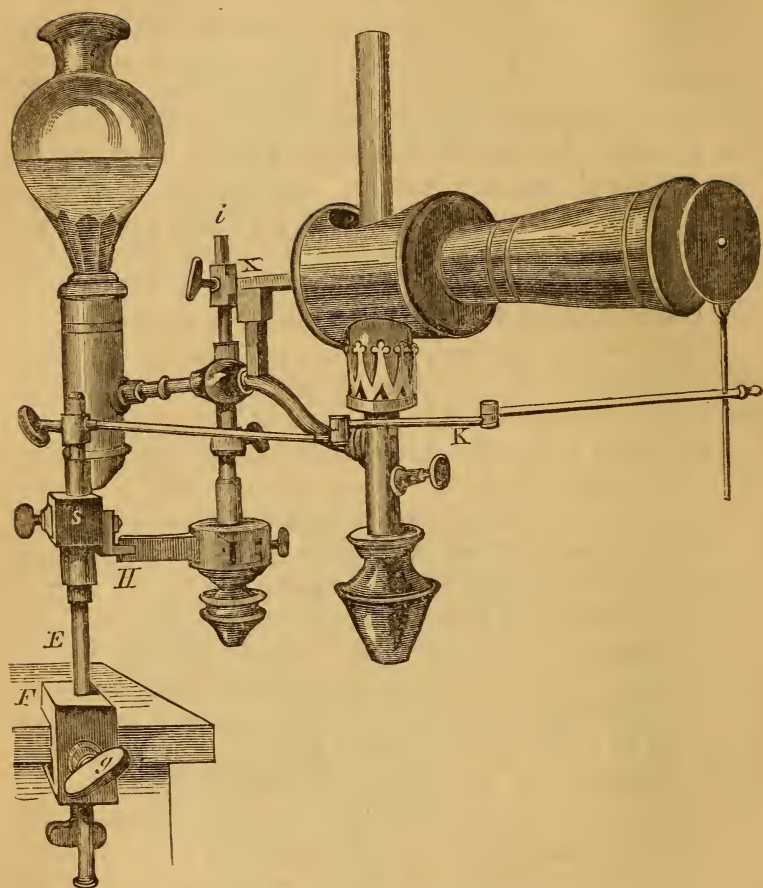
that the surfaces of the glass do not rub together. A third lens (*g*), of three fourths as great refraction, but of larger aperture, forms the point of exit for the converging rays. The apparatus can be adapted to any ordinary sliding lamp. To secure the most intense light, we must take care that the inner lens (*e*) should be brought close to the cylinder of the lamp, by means of the movable bar (*b*.) The distance must vary, according to the size of the lamp. It is evident that the apparatus should be so arranged that the middle of the flame should fall as accurately as possible in the axis of the lens. This axis is indicated in the cut by a horizontal dotted line.

The movable arm (*m*), with two articulators, is always fastened beneath the oil-holder of the lamp. When it is necessary to clean the lenses *c* and *d*, the apparatus is screwed apart at *f*. The large outer lens (*g*) can be taken out for the same purpose, after the ring is removed.

The concave reflecting mirror *i*, $7\frac{1}{2}$ centimetres in diameter is made of glass, covered with pure galvanic precipitated silver, and fastened in metal. It is perforated in the centre, and is provided with a handle about 10 centimetres in length, and by means of the screw *s*, the reflector can be moved up or down, as may be desired, to correspond to the aperture of the illuminating apparatus. It can be inclined backward or forward by means of the ordinary hinge *o*, on its border. A lateral inclination of the reflector is entirely unnecessary, since this position can be readily secured by the movable arm.

To those physicians who have to examine a great number of patients daily in the office, I recommend the use of a stand for receiving the lamp, as is shown in the cut accompanying. By this arrangement, an appropriate position of the whole apparatus can be secured at any instant during an operation by easy manipulation, without laying aside the instruments that are in the hand. A stand (E) runs through an iron clamp, F, that is fastened to the table. By the screw *g*, the stand can be fixed at any height corresponding to the size of the patient. The metallic horizontal arm, H, on a movable ring on the stand, holds a short movable stand *i*, to which the lamp and its accompanying brass tube is attached and screwed.

FIG. 2.



TOBOLD'S APPARATUS FOR ILLUMINATION, WITH STAND.

The arm *k* with three joints, turns directly on the frame *s*.

The lenses of this apparatus are arranged on well-known optical principles. Accordingly, when an examination is to be made, the reflector on the horizontal arm should be adjusted at a proper focal distance from the larger lens at the aperture. What this distance is, can be readily ascertained by a very little practice with the apparatus.

There are two sizes of Dr. Tobold's illuminating appa-

ratus, the smaller being designed for the bed-side. For the office, the larger is much to be preferred.

I use the lenses with a large-sized German-student lamp, adapted for burning kerosene oil. Some prefer gas, and have a stand arranged accordingly. Kerosene has the slight disadvantage that it takes a minute or so for it to warm up and get into a full broad flame. On the other hand, it gives a soft, bright, and constant light, and the lamp in which it is used is kept in order with very little labor.

The chimneys are best cleaned with a brush or a moist rag. If they are immersed in cold water, they are liable to break, even when they are not exposed to heat until many hours afterwards. The surfaces of the lenses should be rubbed only with a piece of chamois-skin. For those who use the apparatus very frequently, it is well to have it permanently adjusted on a stand or table always pointing in one direction, for whenever it is moved, its relative position to the chair on which the patient sits, and the focal distance of the reflector, have both to be studied anew.

It is an advantage to have the apparatus in a room that can be darkened at pleasure, although this is not necessary for the success of the examinations.

Pains should be taken to procure only the best kerosene oil, and to keep the wick always carefully trimmed.

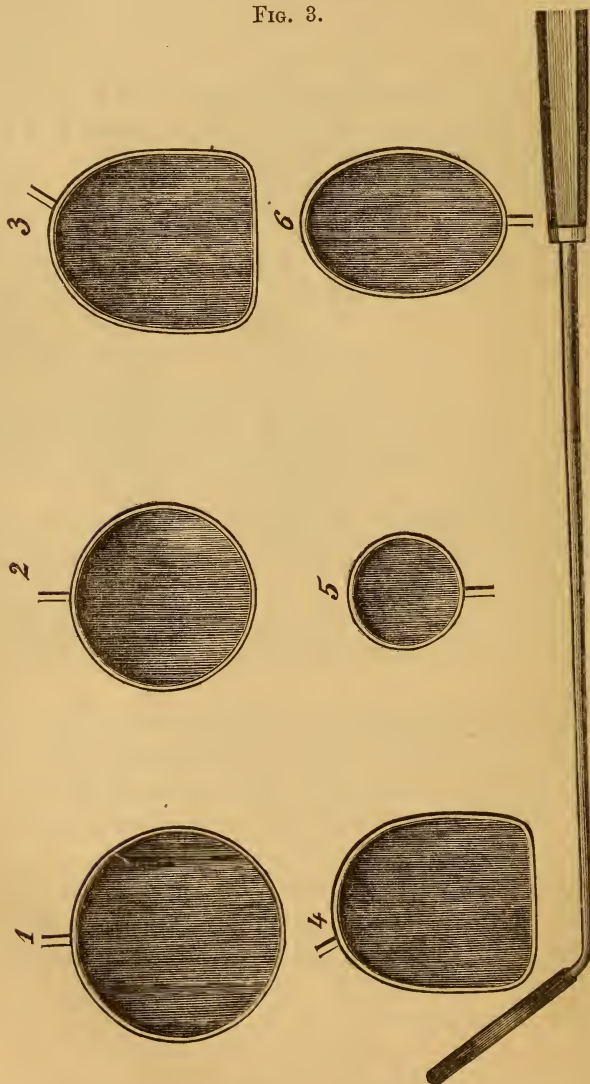
An ordinary argand gas-burner will serve very tolerably as an illuminator for those who have nothing better, but all who pursue laryngoscopy to any great extent will feel the need of a light, that shall be at once more intense and more readily controlled.

The light concentrator of Dr. MacKenzie is quite powerful, and has the advantage of being applicable for any kind of a lamp or even for a candle. It is described in his work on the use of the Laryngoscope.

THE LARYNGEAL MIRROR.

The laryngeal mirror may be made of glass, covered on the back with amalgam, or of finely-polished steel. Steel mir-

FIG. 3.



LARYNGEAL MIRRORS OF DIFFERENT FORMS AND SIZES.

rors are very bright when new, and give a clear image, but they are so easily tarnished by contact of the medicated solutions, and are so liable to become scratched, that they can hardly be recommended.

I always use mirrors made of glass, set in German silver, with a handle of wood. I prefer those of a circular shape, although, when the tonsils are very large, the oval or oblong varieties will be more convenient. Those who practise laryngoscopy very extensively will need a number of mirrors of different sizes, varying from half an inch to one inch and a quarter in diameter. These should be kept perfectly clear, by rubbing them with chamois-skin.

There are throats so little sensitive that they can endure much larger mirrors than those ordinarily manufactured. It is obvious that it is an advantage to possess at least one such mirror for operative procedures, or for the purpose of demonstration.

CHAPTER III.

METHOD OF CONDUCTING A LARYNGOSCOPIC EXAMINATION.

LARYNGOSCOPY is based on the well-known optical law that when rays of light fall on a plane surface, the angles of incidence and reflection are equal. The aperture of the larynx being oblique, renders it necessary to hold the mirror at an angle of about 45° with the plane of the horizon.

It is manifestly impossible to make any one a skilful laryngoscopist by any number of directions and explanations, however extended or minute they may be. A course of private instructions, or the opportunity of witnessing a few practical demonstrations, are of more service than all that can possibly be written on the subject. In this as in every other mechanical procedure, experience is the only teacher and the last appeal.

The following brief directions may be of service to those who are provided with the apparatus, but have not the advantage of private instruction, or do not wish to take the time necessary to work out the art by patient experiments.

1. ARRANGEMENT OF THE APPARATUS.

The lamp for illumination, whether it be the apparatus of Tobold, the light-concentrator of MacKenzie, or an ordinary argand-burner, should be placed on the edge of a stand or table, of about the usual height. The mirrors, tongue-spatula, probangs, chamois-skin, towels, napkins, brushes, syringes, the various solutions and glasses for containing them, and all other needful appliances, should be within reaching distance of the

chair where the physician is to sit. On the right or left of the patient's chair there should always be a vessel, or elevated spittoon, for even when no applications are made, the excitement of examination may cause an increase in the salivary and mucous secretions. Moreover, now and then a very irritable patient may vomit in the midst of an examination, especially if it be awkwardly made, or too far protracted.

2. POSITION OF THE PATIENT.

The patient should be seated on a chair or stool by the side of the table on which the illuminating apparatus is placed, and as close to it as may be convenient. He should sit in an upright position, facing the examiner, inclining the head slightly backward. He should not be allowed to rest his elbows on the table, as he may be tempted to do, for thereby his head and body will be inclined to one side, and thus interfere with the examination.

MacKenzie has proposed a head-rest, similar to that employed by photographers, but fastened to the back of the chair. Although this may be of service in the case of operations on the larynx, it is hardly necessary in ordinary examinations or in making applications. If it be used at all, it must be raised or lowered according to the height of the patient. It may, therefore, be regarded as an unnecessary complication of the laryngoscopic apparatus.

3. POSITION OF THE EXAMINER.

Having arranged all the instruments and appliances likely to be needed for the sitting, at a convenient distance on the table on which the lamp is stationed, or on a stand at his right, the physician seats himself directly opposite and close to the patient, as represented in the drawing.

The examiner should be seated so near to the apparatus that, by inclining the head slightly forward, the eye may be brought into a convenient position directly behind the reflector.

Those who use a reflector attached by a band to the forehead, should also take pains to get seated at the proper distance from the patient, for the reason that any extensive movement of the head will interfere with the examination after it is once begun.

The order of manipulations for the purpose of examination merely is as follows :

a. Adaptation of the light.

If Tobold's apparatus be used, the brass tube containing the lenses, the lamp, and the reflector should be moved up or down according to the height of the patient. The mouth of the tube or the flame of the lamp should be on a level with the patient's eyes, and the reflector should then be brought to the proper focus, and the rays of light thrown upon the pharynx of the patient as he holds his mouth wide open.

A little experience with any form of illuminating apparatus, will enable one to strike this focal distance at once. When the strongest possible light that the apparatus can afford is concentrated in a circular disk on the upper lip and against the posterior wall of the pharynx, then we may proceed at once with the examination. It is well to become accustomed to looking over, or by the side of the reflector, as well as through the hole in the centre. The eye of the observer should usually be about twelve or fifteen inches from the mouth of the patient.

b. Holding the tongue.

The patient should be directed to stretch out his tongue as far as possible, while the examiner first wipes it dry with a napkin or towel that is pressed firmly over the tip, and then seizes it between his thumb and forefinger, at the same time showing the patient how to hold it in the same way with his right hand.

There are occasionally patients who can hold out their tongues by the mere force of will and attention, and many can be trained to do so by a little practice. If the patient's head

incline from its position as he thrusts out his tongue, it should be at once restored, before the next step is taken. The physician can, if necessary, hold out the tongue with his left hand, but it is always more convenient as well as more agreeable for the patient to do it himself. The patient, seated in this way, stretching his mouth widely open, holding his tongue out firmly with his left hand, and looking directly into the eyes of the examiner opposite, may be said to be in the *laryngoscopic position*, and is ready for the

c. Introduction of the mirror.

The examiner now quickly seizes a mirror, holds it a few seconds over the summit of the tube of the lamp, and then presses it against his cheek or his hand in order to see whether it be sufficiently warmed to prevent the condensation of the moisture of the breath, and not so hot as to cause pain in the parts with which it may come in contact. His left hand may all the while be resting on the right shoulder of the patient, in such a position that he can raise or depress the chin at pleasure.

The mirror is held in the right hand like a pen, the larger extremity of the handle resting between the thumb and index finger. *The patient being directed to take a few easy panting respirations*, very much as he would do after ascending a long flight of stairs, the examiner quickly introduces the mirror with the face downward, until its back rests against the uvula. This panting respiration assists the operation in two ways: *first*, by raising the uvula so that the mirror can rest against it without touching the back of the tongue; and *secondly*, by distracting the attention of the patient from the manipulations of the examiner, so that he is not as liable to jerk the head, or allow the tongue to slip from between the fingers.

Special pains should be taken in the introduction of the mirror to avoid hitting the teeth, the tongue, in very irritable patients, and the posterior wall of the pharynx. The patient should now be directed to make a sound as nearly as possible resembling "ah," "ah," "ah," in a slow, uniform, and easy

manner. This is about the only sound that all persons, while in the laryngoscopic position, can produce, without the slightest difficulty, and in making it the epiglottis is raised, and the vocal cords are thrown into rapid vibration.

At the first examination of a patient, it is well for the physician to give directions in regard to panting and phonation before the mirror is introduced. In all cases where the physician wishes the patient to breathe in any particular way, or to make any sound, it is best to set the example himself just at the proper moment, and as long as it is desired.

During this act of phonation, the handle in which the mirror is held is to be raised and directed toward the angle of the mouth, against which the shank may rest as soon as the larynx comes into view. The angle of inclination of the mirror must depend on the inclination backward of the head of the patient, the angle of the aperture of the larynx, and the relative position of the observer. It is best for the examiner to keep his eye in a fixed position, either at the central perforation of the reflector, or directly by the side of it, while he controls the patient's head with the left hand and the mirror with the right.

The mirror should be withdrawn before there is any symptom of retching, otherwise the succeeding introductions will be made with difficulty. And if at any stage of the operation the patient begins to lose his self-control, or the observer makes any false motions that cause the patient to retch, hack, or to jerk his head out of the line of vision, the mirror must be at once withdrawn, and another attempt made after a brief interval of rest.

There are patients so irritable, that when retching has been once excited by a false introduction of the instrument, or by holding it too long in position, they are unable to endure another attempt for several hours. With such very great caution should be exercised. It is much better that the mirror should be withdrawn a dozen times without catching an image of the larynx, than to retain it in position even one second too long. Obviously no time can be specified beyond which the mirror should not be retained. Indeed, it would be difficult to give the average number of seconds that it can be tolerated with-

out annoyance. There are some who are entirely willing to have the mirror kept in position in the throat for five and ten minutes, and even longer; and there are others who begin to grow uneasy in the same number of seconds.

To bring the different structures into view, it is necessary to turn the mirror more or less towards either side, to raise or depress it, or otherwise to vary its position. The art of doing this easily and calmly, without annoying the patient, can be learned only by experience.

But there are certain obstacles that have often to be overcome by the laryngoscopist before a satisfactory examination can be made.

The mouth may be very small, or the patient may for some reason be unable to open it sufficiently wide. For severe cases Dr. Cohen recommends the mouth-distender that is used by dentists.

The tongue may be very irritable, or abnormally fleshy and protuberant in the centre. Practice will in a measure overcome any difficulty of this kind, but in some cases it may be necessary to resort to the use of some kind of depressor or spatula, shaped so as to keep down the back part of the tongue.

In regard to the irritability of the pharynx, it will be found that it varies in the same individual at different times, according to the state of the system. For those exceptional cases that do not yield to practice, it is well to try some of the methods of benumbing the sensibility, that have from time to time been recommended. Of these the most practical and reliable are either partial chloroformization, or holding small pieces of ice in the mouth, as suggested by MacKenzie.

Enlarged tonsils render it necessary to use an oval or oblong mirror. In extreme cases, excision may be necessary.

The epiglottis is more liable than any other part to interfere with the examination, on account of its very frequent tendency to incline backward, and thus to conceal the glottis. The act of making the "ah" sound already described, has a tendency to raise the epiglottis; when there is no deformity a

deep, powerful inspiration will have the same effect. I cannot recommend any of the contrivances that have been suggested for the purpose of drawing the epiglottis forward, though in obstinate cases the epiglottic pincette is worthy of a trial. Very few indeed can bear the touch of any instrument on the epiglottis without previous training. The epiglottis is sometimes so much enlarged as to hide the glottis. In such case, we must place the mirror as low as possible in the pharynx, and at a smaller inclination than usual.

Finally, the uvula itself, which is so convenient as a resting-place for the back of the mirror, is often so much elongated that it turns under, and is reflected in the image, to the great annoyance of the operator. The best and only remedy is to clip off the lower portion. Those who are just beginning to make laryngoscopic examinations will find that the uvula will often persist in obtruding itself in the image of the mirror, even when it is not elongated.

CHAPTER IV.

THE LARYNGEAL IMAGE.

THE minute anatomy of the larynx will be found in the appendix, and in the "*Lehrbuch der Laryngoscopie*," (Text-book of Laryngoscopy,) by Dr. Tobold. I shall only attempt to describe the parts as they appear in the mirror, and as they directly and practically concern the art of laryngoscopy or the therapeutics of laryngeal diseases.

The first object that comes into view in a laryngoscopic examination is the back of the tongue, with its large circumvallate papillæ, then the fosse between this and the anterior surface of the epiglottis, and then the tip of the epiglottis itself. In many cases, this is all we see on the first examination. Those who are just beginning to practise the art must not expect to get a full view of the glottis on their first attempts. But if the examination be systematically and successfully conducted, the arytenoid cartilages, with their apices, the cartilages of Santorini next appear, then the ary-epiglottic folds, then the ventricular bands, or false vocal cords, as they were formerly termed, the ventricles of Morgagni—and last of all, the two pearly-white vocal cords closing and opening with great rapidity.

Below the glottis, more or less rings of the trachea are seen, especially on deep inspiration. The number of rings that can be brought into view varies in different individuals and with the character of the inspiration.

We occasionally meet with patients in whom the bifurcation is quite distinctly seen, when the circumstances of light, position and inspiration are all favorable. In a normal condition, the vocal cords open in inspiration and close in phonation.

THE IMAGE IN THE LARYNGEAL MIRROR.

In examining the image in the mirror, or a drawing representing it, we should consider that it represents the larynx not of oneself, but of another person. Let the examiner for the moment imagine himself to be the patient, and the relative position of the parts will at once be clear to him. He will see that the right vocal cord of the patient must be seen on the left side of the mirror, and *vice versa*.

The different parts of the larynx that are of special concern to the laryngoscopist are well represented in the accompanying drawings.

FIG. 4.

(After Mackenzie.)

FIG. 5.

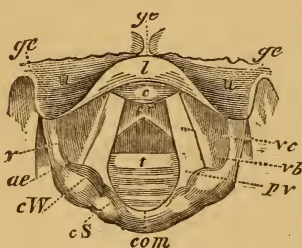


Fig. 4.—Laryngoscopic drawing, showing the vocal cords drawn widely apart, and the position of the various parts above and below the glottis, during quiet inspiration.

- ge. Glosso-epiglottidean folds.
- u. Upper surface of epiglottis.
- l. Lip of epiglottis.
- c. Cushion of epiglottis.
- v. Ventricle of larynx.
- ae. Ary-epiglottidean fold.
- cW. Cartilage of Wrisberg.
- cS. Capitulum Santorini.
- com. Arytenoid commissure.
- vc. Vocal cord.
- vb. Ventricular band.
- pv. Processus vocalis.
- cr. Cricoid cartilage.
- t. Rings of trachea.

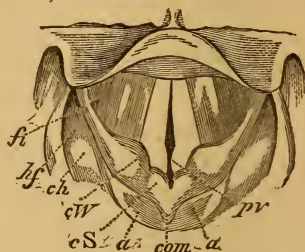


Fig. 5.—Laryngoscopic drawing, showing the approximation of the vocal cords, and the position of the various parts in the act of vocalization.

- fi. Fossa innominata.
- hf. Hyoid fossa.
- ch. Cornu of hyoid bone.
- cW. Cartilage of Wrisberg.
- cS. Capitulum Santorini.
- a. Arytenoid cartilage.
- com. Arytenoid commissure.
- a. Arytenoid cartilage.
- pv. Processus vocalis.

The size and thickness of the tongue varies very much in

different individuals. Occasionally, as has already been stated, patients are met with whose tongues are so thick, or at least so protuberant, that it is quite difficult to make an examination.

Probably no object that appears in the laryngeal mirror varies more in size and appearance than the epiglottis. Usually we see, on examination, its superior surface, its free edge, and the cushion. The latter is quite red in appearance, the other parts being of a pinkish, yellowish color, somewhat resembling boiled salmon.

In some cases the epiglottis is very narrow, in others very broad; sometimes only its upper surface is visible, and then again only its border; sometimes it hangs over the larynx, and partly closes the aperture.

The tubercles of Wrisberg and Santorini are somewhat roundish in shape and vary much in size. The tubercle of Wrisberg is most frequently found in the negro. The arytenoid cartilages and ventricular bands are pinkish in color and of a deeper tinge than the ary-epiglottic folds.

The vocal cords are of a pearly or grayish white color. They appear incessantly in motion, and present at one time an elliptic, and at another an oblong or triangular shape, varying with respiration and phonation.

Below the glottis the rings of the trachea and cricoid cartilage appear of a light color, while the mucous membrane between them is pinkish.

The openings of the bronchi appear as two indistinct dark rings, separated by the light-colored bifurcation.

CHAPTER V.

AUTO-LARYNGOSCOPY.

IN the examination of one's own larynx, all that is needed in addition to the apparatus already described is a mirror of any convenient size, so placed that the image in the laryngeal mirror may be distinctly seen reflected in it by the individual who is making the examination.

Special forms of apparatus have been devised for this purpose by Czermak, Johnson, and others; but for ordinary use any mirror placed before the observer will be tolerably satisfactory. If the examiner can hold out his tongue without the aid of the fingers, he can, by reflected light, both observe his own larynx and demonstrate it to others by raising a toilet mirror before him in his right hand, while he introduces the laryngeal mirror with the left.

I am in the habit of demonstrating my own larynx in this way, and find much less difficulty in doing so than in any ordinary examination of a patient. There are very few who cannot by moderate practice and the exercise of will, thus acquire the habit of holding out the tongue without the aid of any artificial arrangement.

For those who wish to demonstrate their own vocal cords to a class of students, or to any large number at once, it is well to make the examinations before a large stationary mirror. In this way all who can stand behind the chair of the manipulator can obtain a view. Another method that is very convenient is, to sit with one's back to the sunlight, before a mirror that reflects the rays into the back part of the throat.

Those who desire to make elaborate physiological investigations on themselves, or to instruct large classes of students, might do well to obtain the special apparatus of Czermak.

CHAPTER VI.

APPLICATION OF REMEDIES TO THE LARYNX UNDER THE GUIDANCE OF THE LARYNGOSCOPE.

LONG before the laryngoscope had been adopted into practice, applications had been made to the larynx and even into the trachea, by means of the simple probang. Although the time was when the possibility of reaching the trachea was doubted by many in the profession, it is now abundantly established that it can be done, and that, too, without great difficulty. If a careful laryngoscopic examination has clearly shown the size of the glottis and the relative position of the epiglottis, the probang, containing any solution, can be introduced directly against the glottis, and at the moment of phonation can be forced between the vocal cords into the trachea.

In patients who are very irritable, or who have not become accustomed to the examination, it is better to make the application in this way, at first, until, by longer practice, they can learn to endure the presence of the mirror long enough to allow the instrument to be introduced under its guidance.

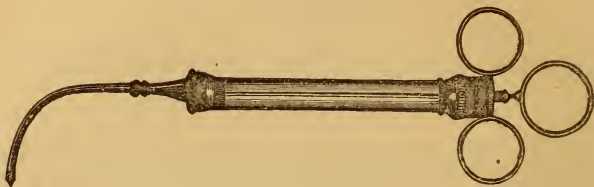
Such a procedure is manifestly uncertain in its effects, and cannot be relied on when it is desired to reach any particular spot in the larynx.

Under the guidance of the laryngoscope, applications may be made as solutions, as powders, or in a solid form. By far the most common form is by solutions of various strengths. These are usually best applied by means of sponges, or camel's-hair pencils. Syringes are convenient in some cases, but it is impossible with these to localize the fluid on any part.

The brushes and sponges used in the application of solutions are firmly attached to wire made of alumina, copper, or silver, or to rubber holders. The handle should be light and

of a convenient shape, and the wire should be bent at angles varying from 100° to 125° . It is well to have at hand a variety of sponges and brushes, inclined at different angles.

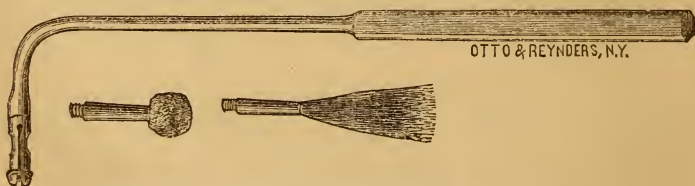
FIG. 6.



LARYNGEAL SYRINGE.

It will be seen that Dr. Tobold is strongly in favor of sponges, believing that they assist the cure by their mechanical effects. One of the difficulties experienced by a laryngoscopist is that nervous and fastidious patients will object to having instruments introduced into their mouths, that have been previously used on others. This difficulty can be met only in two ways, *first*, by keeping on hand at all times a large variety of sponges and brushes, replacing the old with new as fast as they become much soiled, and *secondly*, by washing and wiping the handles in the presence of the patient, just before introduction. The rubber holder represented in the cut (Fig. 7), I have found, on the whole, more

FIG. 7.



LARYNGEAL HOLDER, WITH BRUSH AND SPONGE.

convenient than any other instrument for making applications to the larynx. It may be connected at its extremity with a sponge, brush, or with pledgets of cotton, or bits of sponge that may be thrown away immediately after using. It may be curved at any angle by slightly heating it, over an alcohol lamp.

The manner of employing these and similar instruments under the guidance of the larygeal mirror, is as follows :

1. The patient should be placed in the ordinary *laryngoscopic position* already described.

2. The operator should introduce the mirror with his left hand, by the rules that have been laid down, meanwhile holding the sponge, or brush, or syringe, already well moistened with the solution, by the handle between his teeth, or allowing it to rest on the table at a convenient distance.

3. The instrument should then be introduced rapidly and surely, just before the mirror, until it points directly towards the locality designed to be touched. At this instant the handle should be quickly raised a sufficient distance to reach this spot, when the patient will begin to retch and choke. Both instrument and mirror should now be quickly withdrawn. Both in the introduction and in the withdrawal, special pains should be taken not to hit the teeth, the tongue, or the lips, either with the instrument or the mirror.

These rules, however, are much easier recorded than carried out in practice. *Three* difficulties will at once suggest themselves, that must be overcome before the operation of making an application to the larynx under the mirror can be performed with entire satisfaction. In the *first* place, the operator must, by long and varied practice, become accustomed to conducting a laryngoscopic examination with the left hand, and at the same time introducing an instrument with the right.

Secondly, he must by practice acquire the art of accurately measuring the distances in the larynx as they appear in the mirror.

Lastly, the patient, if at all irritable, must be *trained* to endure the presence of both mirror and instrument in his throat at the same time.

There are patients so irritable, that it is impossible without long training to accustom them to the presence of instruments in the throat, sufficiently to enable us to make application with absolute accuracy under the guidance of the laryngoscope. In such cases, when we cannot have them for a long time under

observation, the best that we can do is to make the applications in the manner formerly employed by Trousseau, Belloc, and Green, before the discovery of the laryngoscope, as has been previously described.

In his Lehrbuch before referred to, Dr. Tobold describes a phantom that he and others found of service, for the purposes of practice in the arts above mentioned

CHAPTER VII.

INFRA-GLOTTISCOPY.

IN 1858, Dr. Neudörfer suggested the idea of examining the inferior surface of the vocal cords, by means of a very small mirror, introduced through a fenestrated canal, after tracheotomy. In the year following, Czermak first, and shortly afterwards Von Bruns, demonstrated the feasibility of this idea on living patients.

The cases are quite rare where this method of examination will be indicated; but since the publication of the experience of Czermak and Von Bruns, a number of observers have recorded successes in that direction.

In patients on whom the operation of tracheotomy or laryngotomy has been performed, the epiglottis is sometimes bound down by cicatrices, rendering it impossible to get a view of the glottis by the usual method. The inferior surface of the vocal cords is of a red color.

MAGNIFYING INSTRUMENTS.

It was quite natural to suppose, that, if the image in the laryngeal mirror could be magnified in some way, the inspection of the parts would be much aided; and accordingly we find that, as far back as 1859, Dr. Wertheim suggested the idea of employing concave mirrors. The objection to this method was, that while it exaggerated the portion of the larynx reflected in the centre of the mirror, it gave a distorted image of other parts.

Türk employed a small telescope for the purpose of magnifying the image, and Voltolini adapted an opera-glass to be

used with sunlight. But it seems that no one has secured very satisfactory results by any form of apparatus yet devised; nor is it, indeed, probable that any very practical improvements will be made in this direction. Furthermore, I may say that the combination of any magnifying power with our present laryngoscopic apparatus is in no way a necessity, and could be only of very exceptional advantage.

A combination of appropriate instruments, strong, steady illumination, and practice on the part of the observer, will bring all the parts of the larynx into view with sufficient distinctness for all purposes of diagnosis and treatment.

CHAPTER VIII.

RHINOSCOPY.

RHINOSCOPY is the art of examining the posterior nares, the mouths of the eustachian tubes, and the parts adjacent to them, by placing a mirror in the back part of the mouth.

Bozzini made the first attempts in this direction, in 1807. Afterwards, Baumès and Avery experimented somewhat in the same line; but it was reserved for Czernak to perfect this method of examination, and to force it on the attention of the medical world.

In rhinoscopy, the following instruments are required :

1. Some form of illuminator, as in laryngoscopy. In the one case, as in the other, I prefer Tobold's large illuminating apparatus, with the reflector attached. But any form of illuminating apparatus that will answer for laryngoscopy will serve equally well in rhinoscopy.

2. Two or three small mirrors, varying in diameter from a quarter to half an inch. These should be made after the model of the laryngeal mirrors, but the angle they make with the handle should more nearly approach a right-angle.

Patients differ so much in regard to the capacity of the naso-pharyngeal space that it is well for those who make many examinations to provide themselves with a number of rhinal mirrors of various sizes.

3. A tongue-spatula. I should hardly dare to attempt to describe, or even to enumerate the different styles of spatulas for holding down the tongue that have from time to time found favor. The ordinary form of spatula so much used by general practitioners is inconvenient in rhinoscopy, because in using it the hand of the operator is very apt to interfere with the view; moreover, it depresses the anterior,

and raises the posterior part of the tongue, and pushes the epiglottis upwards.

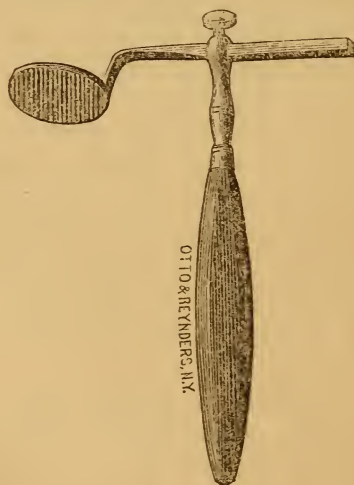
FIG. 8.



TOBOLD'S SPATULA.

The hinge-spatula answers very well, and if it be made of different sizes will be satisfactory. I use the form represented in the cut. It is not, however, to be recommended as preferable to all others. Türk's spatula, in which the handle

FIG. 9.



TÜRK'S SPATULA.

is made separately from the blade, has this advantage, that one handle will serve for blades of different sizes.

Dr. Cohen of Philadelphia, uses an instrument of hard rubber, the tongue portion of which is about five inches in length. The handle is of one piece with the blade, and is bent to an angle of 70° , so that it is directed under the chin, and towards the neck of the patient, when the tongue portion is applied. Just as with several forms previously described, it can be applied and held by the patient himself. Its shape can be altered at will to suit any conformation of tongue, by holding it over the flame of an alcohol lamp.

But any form of spatula that depresses the base of the tongue, that can be held in position by the patient when necessary, and that can be adapted to different ages, will answer satisfactorily in rhinoscopy, as well as in examinations made on any part of the throat.

There are those who still recommend the use of palate-hooks, or other similar contrivances, for the purpose of bringing forward the uvula. To mention all the styles of hooks, forceps, nooses, etc., that have been suggested in rhinoscopy, would be simply bewildering. The very multiplicity of the instruments devised for raising and bringing forward the uvula, is the best evidence that none of them are satisfactory. For the majority of cases I have little faith in any, or in all of them combined. Although I have been accustomed to practise many familiar operations on my own person, especially about my head and throat,—experimenting in this way very frequently, with the eustachian catheter, Politzer's apparatus, the posterior nasal syringe, and with the laryngeal mirror, for half an hour at a sitting—yet I shall never forget the agony of suspense I endured, when, with a noose slipped over my uvula, and fastened to a band on my forehead, and a spatula firmly pressing down the tongue, I submitted, for two or three minutes, to an attempt at rhinoscopic examination, at the hands of a skilful and practised laryngoscopist.

The palate hook that Czermak recommended is usually made of German silver, and is four or five inches long. At one end it is fastened to a handle, and at the other it turns at a right angle. The curved extremity varies in length from one quarter to one-half of an inch.

For those patients who can be educated to bear it, it is at once the simplest and the best contrivance yet devised for bringing forward the uvula. Dr. Elsberg uses a hook similar to that of Czermak, with a little spring attached for holding the uvula.

METHOD OF CONDUCTING A RHINOSCOPIC EXAMINATION.

According to my experience, rhinoscopy is generally either quite easy or quite impossible. There are those whose throats, and especially the spaces between the posterior wall of the pharynx and pillars of the soft palate, are so capacious that any one at all skilled in the use of the laryngeal mirror can get a view of the posterior nares and the orifices of the eustachian tubes. But, on the other hand, there are very many in whom this space is so narrow that it is impossible to inspect the parts with any satisfaction at all. And again, there are not a few whose throats, particularly the uvula and soft palate, are so irritable that they cannot endure, even for an instant, the presence of the smallest rhinal mirror without long and wearisome training. This latter class includes many who submit to laryngoscopy without difficulty.

The principal steps of a rhinoscopic examination in a *practicable* case are as follows:

1. The patient should be seated directly opposite the observer, as in laryngoscopy, but inclining the head somewhat forward, so that the light can be thrown quite low in the throat, and also that the uvula may hang forward.

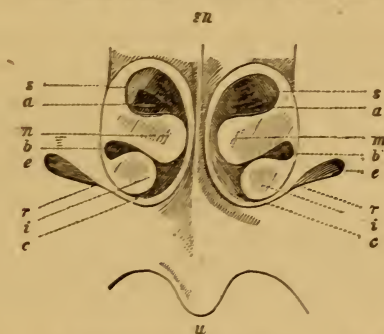
2. The tongue is then depressed with the spatula, and the patient directed to respire through the nose or to make some nasal sound, so that the uvula may incline downward and forward.

3. The examiner is then to introduce the mirror with his right hand, previously warming it (as directed in laryngoscopy), taking care not to hit the teeth or the tongue. The mirror should be placed in the back part of the throat, just below the uvula, or on either side of it. The angle of its reflecting sur-

face and its position should be varied until one by one all the parts embraced in the naso-pharyngeal space are inspected.

The image in the rhinal mirror is so peculiar that at first it is recognized only by the exercise of considerable faith on the part of the observer. The entire surface of the naso-pharyngeal space cannot be seen at once in the mirror except in the cases where the uvula is decapitated, or the cavity is unusually large. The complete image that appears is thus represented..

FIG. 10.

POSTERIOR NARES. (*After Mackenzie.*)

sn. Septum nasi.

s. Superior turbinated bone.

m. Middle turbinated bone.

i. Inferior turbinated bone.

a. Superior meatus.

b. Middle meatus.

c. Inferior meatus.

e. Eustachian orifice.

r. Ridge between the Eustachian opening and lower border of the nasal fossa.

It is sometimes possible to examine the cavities of the nose by inserting an ear-speculum, or some similar instrument, in the anterior nares, and reflecting the light directly within it.

I examine the state of the mucous membrane in this way not unfrequently, and I find that in some cases it is possible to see quite far up the nose. It has been claimed that it is possible to examine through the anterior nares the posterior wall of the pharynx, the orifices of the nasal ducts and of the eustachian tubes. But the instances where such a view can be gained are very exceptional, and the patients who are so formed are to be looked upon as curiosities.

Rhinoscopy is useful in diagnosing the various forms of disease that occur in the posterior nares. In those very frequent cases where it is impossible to get a satisfactory view

of the parts, we are compelled to rely on happy guessing and the history of the case.

The parts that are concerned in rhinoscopy are liable, however, not only to that very common and very annoying affection known as "catarrh," but also to syphilitic and poly-poid affections, and to destruction of bone. Obstructions of this kind, either in the nares or at the orifice of the eustachian tubes, cannot be diagnosticated or treated without the assistance of rhinoscopy.

It needs no argument of mine to prove that, in the treatment of diseases of the ear, rhinoscopy must be of great service. Those who admit the intimate and very frequent connection between diseases of the throat and the middle ear, and the value of the eustachian catheter in the treatment of many aural affections, will surely not deny that rhinoscopy is an almost indispensable aid in all cases of doubt and obscurity. Even those most experienced and most successful in the introduction of the eustachian catheter recognize the fact, that it is not unfrequently difficult to satisfy one's self beyond a doubt, whether the orifice of the tube is entered or not.

CHAPTER IX.

RHINITIS.

(*Catarrh—Naso-pharyngeal Catarrh—Coryza, Blennorrhœa.*)

By this title I designate the very common form of inflammation of the mucous membrane of the nose, whether of the acute, sub-acute, or chronic variety.

The generic term, *Catarrh*, (*κατα* and *ρεω*, a running down,) which is so often applied to inflammations of these parts, both by the profession and the laity, is certainly as inaccurate and as inexpressive of the nature of the disease, as would be the term neuralgia applied to all states of the system attended with pain.

Naso-pharyngeal catarrh would include all diseases of the nasal passages and pharynx, attended with morbid discharge.

The term Blennorrhœa, that has been suggested, is, if possible, even more inappropriate than otorrhœa applied to ulceration of the membrana tympani.

For *three* very positive reasons, it appears to me that the term rhinitis should be applied to inflammations of the mucous membrane of the nasal passages.

1. It is accurately expressive of the nature of the disease. On the other hand, blennorrhœa, catarrh, and so forth, simply indicate a single prominent *symptom* that may obtain in other and more serious diseases of the same parts.

2. It is consistent with analogy, and in conjunction with bronchitis, tracheitis, laryngitis and pharyngitis, completes the nomenclature of the inflammations of the mucous membrane of the air-passages.

3. It is shorter, and more convenient than any other term that has been proposed.

FREQUENCY OF THIS DISEASE.

Those who have had much to do in the treatment of diseases of the larynx and pharynx, will require no apology for thus introducing a chapter on Rhinitis, even in a work professedly devoted to chronic diseases of the throat. For, all who undertake the department of laryngology will find that very many of the milder as well as the more serious disorders of the larynx, are preceded by and complicated with kindred affections of the nose, that prove rebellious against every method of treatment they can devise. For this reason it seems very strange, that so little space has thus far been devoted to this subject, even in elaborate and exhaustive treatises on diseases of the throat. Not only in times long past, but even since the introduction of the laryngoscope, physicians seem to have almost entirely neglected this very humble but very frequent and annoying disease, and to have resigned the therapeutics of the parts concerned to the ignorance and tender mercies of advertising quacks and country grannies. For the past ten or fifteen years there has been scarcely any disease (excepting, perhaps, the venereal) that has brought in so rich and abundant a harvest to charlatans, as the inflammations of the nose and pharynx. Gentlemen who in all other matters are prudent, judicious, and reliable, suffer themselves to be robbed in purse and health, if not in life, in order to win a doubtful chance of being relieved of long-standing "catarrhs" at the hands of those who not even desire to comprehend the simplest principles of pathology.

But that good and true citizens are thus deceived, is rather the fault of the profession than of themselves. In the desperation of self-defence, they are compelled to consult those for whose attainments or principles they have no respect.

Although rhinitis is not usually absolutely painful, it is yet in many cases intensely harassing, and embitters existence far more than very many diseases that have called forth the best energies of the profession. It has been stated that rhinitis is a very frequent form of disease. It might be said with propriety that it is universal. Neither sex and no age is free

from liability to attacks of acute rhinitis, and at least a majority of those who dwell in our northern climate, are affected more or less, at some time of their lives, with the sub-acute or chronic form—though it may not necessarily be so severe or long-continued as to call for treatment.

CAUSES.

The one great cause is, of course, *exposure to cold*. Sitting in a draught of air, premature removal of the under-clothing, wetting the feet, and all the various circumstances that conspire to close the pores of the skin, may bring on an acute attack of rhinitis within a few hours.

In the vast majority of cases, these attacks pass off either with or without treatment, leaving behind no unpleasant consequences.

But oftentimes one cold follows so closely after another that the mucous membrane of the nasal passages does not have time to recover its normal condition. Consequently it becomes weakened by repeated attacks, and the inflammation may take on the sub-acute form.

This in turn may pass away by the coming on of warmer weather, or by the *vis medicatrix naturæ*, in spite of the carelessness of the patient, leaving the mucous membrane, however, in a more susceptible state than is natural. But if, on the other hand, the individual be of a scrofulous or delicate habit, with a mucous membrane throughout relaxed and flabby, the inflammation may very slowly go on to the chronic stage, hastened in its advance by each repeated chill. In those of firm, wiry constitutions, however, this chronic stage is not usually reached until after severe and frequently repeated exposure to wet and cold.

The chief predisposing causes, are *confinement in overheated rooms and smoking*.

Those who labor or idle over registers or near hot stoves, are of necessity more susceptible to rhinitis, as well as to pharyngitis and laryngitis than those who are more active and more uniformly exposed to out-door temperature. Hot

air continually breathed in against the delicate mucous membrane of the nasal passages, renders it susceptible to acute inflammation, whenever the system remains chilled for any length of time.

Exposure to night air is perhaps the most frequent as well as the most powerful exciting cause of rhinitis, and one also that interferes with treatment more than almost anything else. Those whose occupation compels them to travel much by night, and particularly the *habitués* of late evening amusements, are very liable to suffer from rhinitis, and are very rebellious to any method of treatment, so long as they remain unchanged in manner of life.

Smoking has long been a stone of stumbling and rock of offence to those afflicted with inflammation of the lining membrane of the air passages. Hot smoke has a far more locally relaxing tendency than hot air, and when the two are combined, as always in the act of smoking, the pernicious effects are very marked. A perfectly healthy nose and pharynx, in an adult, is quite hard to find, and in habitual and excessive smokers, there is always evidence of more or less chronic inflammation of these parts. Tobold is of the opinion that sitting in a room where much smoking is going on, is more injurious to chronic laryngitis than the act of smoking. If this be true, (and it is hard to prove or disprove the assertion,) then it would seem that the fumes of the tobacco smoke were chemically weakening to the tissues.

Hot drinks, including tea, coffee, and liquors, unquestionably predispose to rhinitis, by first affecting the mucous membrane of the pharynx.

SYMPTOMS.

Both the objective and subjective symptoms of rhinitis in its various stages, are so declared and so familiar that they need not be described in much detail.

The leading symptom, and the one that formerly gave name to the disease, is *increased secretion*; but we meet with cases where the reverse condition obtains. In the latter form

(so absurdly and paradoxically termed "dry catarrh"), the subjective symptoms are usually more disagreeable than when the secretion is abundant.

At the onset of an acute attack, there is a feeling of pressure, weight and stoppage in the nasal passages, and actual headache, while the secretion is for a short time almost entirely suppressed. Before many hours the watery secretion begins to flow, but without immediately diminishing the pressure and heaviness.

In the sub-acute stage, the secretion is copious and altered in quality. It becomes much thicker, and is oftentimes slightly discolored, and the odor is sometimes slightly offensive.

In the chronic stage, there is usually hyper-secretion, that varies much in quantity at different seasons of the year. It is in the majority of cases more abundant and more annoying in cold weather. Active exercise in the open air—such as running, leaping, laboring, skating, and so forth—increases the flow of the secretion, and oftentimes compels the patient to use the handkerchief every moment.

Very often the secretion in the acute, or sub-acute stages is so irritating as to cause an exzematous eruption on the borders of the anterior nares and on the upper lip.

Even in the chronic stages there may be frequent and harassing headaches, more particularly in the neighborhood of the frontal sinus.

Sneezing is a symptom that is almost invariably manifested at the commencement of an acute attack, and sometimes continues through the entire progress of the disease, even into the chronic stage. A lady patient of mine, who had suffered from severe and long-standing rhinitis, as well as pharyngitis, attended with very profuse discharge, said that on rising in the morning she was oftentimes seized with violent attacks of sneezing that would not let her go until she was entirely exhausted. She said that it was not an unusual thing for her to sneeze forty or fifty times in succession. In her case there was undoubtedly an abnormal irritability of the sensory nerves supplying the mucous membrane of the nasal passages, so that the collections of secretion were as annoying as a foreign body.

A feeling of dryness and heat in the anterior nares, is a very common symptom in chronic rhinitis, and is sometimes much more annoying than the hyper-secretion. The rhinal secretion becoming incrustrated in the passages, causes such constant itching and tickling, that the patient cannot resist the temptation of picking his nose. This symptom is more observed in warm than in wet or cold weather, and is much aggravated by exposure to dusty winds.

If it be possible to make an examination with the rhinal mirror in a case of chronic rhinitis, the posterior nares, including the septum, will present a congested appearance, with bluish streaks, and all the various appearances that obtain in inflammation of the pharynx. The normal color of the septum is a bright pink, and of the posterior nares nearly the same, though somewhat paler. The orifices of the eustachian tubes in health have a yellowish color. When the chronic rhinitis is associated with pharyngitis, (as is generally the case,) hard or soft collections of mucus, sometimes more or less discolored, are often found in the posterior nares. These sometimes "drop down," as the patients say, and give rise to coughing and expectoration.

When a strong light is reflected on the anterior nares, the mucous membrane appears congested and swollen, often exhibiting bluish streaks. Masses of secretion will be found adhering in the inferior meatus. The swelling of the mucous membrane is frequently so great as to almost close the passages and compel the patient to open the mouth in breathing.

But in very severe or long-standing cases of rhinitis, the dorsum and lobe have a reddish, shining appearance, just as at the onset of an acute attack. The most superficial and even unprofessional observer cannot fail to notice the marked difference in color, between a healthy nose and one in which the mucous membrane is subject to chronic inflammation.

Ezema, which is the name given to that form of rhinitis attended with a peculiarly offensive discharge proceeding from ulcerations, is its own diagnosis. The nature of the disease is advertised as soon as the patient approaches, but a rhinoscopic examination may sometimes enable us to determine the precise locality where the ulceration is going on.

PROGNOSIS.

The great majority of cases of acute rhinitis, whether accompanied with pharyngitis and laryngitis or not, usually recover in a few days and the patient goes on and forgets that he was ever afflicted. But now and then one attack supervenes on another so rapidly as to destroy the tone and recuperative power of the mucous membrane, and the disease falls into the sub-acute and ultimately into the chronic stage.

As a rule, the light-haired, fair-skinned and delicate are especially liable to this, as to every other form of inflammation of mucous membranes, and yet some of the most obstinate cases of chronic rhinitis I have ever treated have been in vigorous, hard-working men, every way healthy in other respects. Farmers, day-laborers, and out-door mechanics, with powerful lungs and muscles, and who have every function of every other portion of the body performed in absolute harmony, are often the victims of chronic rhinitis. But, as with nearly all other diseases, this also, is more frequently the appanage of the poor and oppressed than of the cultivated and wealthy. When it attacks the weakly and scrofulous, it is apt to improve with the bettering of the general condition.

Therefore, children who suffer from rhinitis in early years often "out-grow it," as the grandmothers say, as they advance to maturity, and the enemy may never again disturb them. Cases, however, that ensue after measles and scarlatina, are more likely to run a protracted course, and being always associated with pharyngitis, are sometimes difficult to treat, and the results are not as certain or as speedy.

But though the heirs of scrofulous parentage are particularly liable to this form of inflammation in all its stages, it has yet to be proved that there is any direct connection between rhinitis or pharyngitis even, and tuberculosis of the lungs. The plausible idea that the disease will "work down" is a favorite theme with quacks, and is quite universally dreaded by the masses. But it is, I think, untenable. Pulmonary tuberculosis is very often associated with rhinitis just as it is with conjunctivitis, but it is no more a consequent in one case than in the other.

What the issue will be in any given case, if entirely let alone, it is impossible to predict, for the disease seems to be a law unto itself. I have known quite severe cases to recover, absolutely and permanently, without any treatment whatever, even in persons of delicate and susceptible constitutions.

Sometimes there appears to be a metastasis of the affection; I have very recently treated a case of acute rhinitis, from which the patient had often suffered, and always apparently as a metastasis of rheumatism in the ankles.

It may remain stationary for years, or slowly grow worse and worse, until in old age it becomes at once incurable and intolerable.

But after all, the chief thing to be dreaded in rhinitis is the extension of the inflammation into the upper part of the pharynx, and from thence through the eustachian tube into the middle ear, with the long train of pathological results—obstruction of the tubes, chronic inflammation of the middle ear, sinking in of the membrana tympani—and the invariable consequence, permanent hardness of hearing. For this reason, if for no other, the attention of physicians should be directed to rhinitis and pharyngitis at their incipience: and these very serious results should be forestalled by appropriate treatment.

After the mucous membrane of the nose has been once affected by chronic inflammation and has been well cured, it will ever afterward be more or less susceptible to acute or sub-acute attacks, however careful or judicious the treatment may have been.

This is just as true, however, of all the mucous membrane lining the nasal ducts, the eustachian tubes, the middle ear, the pharynx, larynx and trachea.

TREATMENT.

In the diseases of no part of the body except, perhaps, the ear, has the treatment, from time immemorial, been more unscientific and unsatisfactory, than in those of the nasal passages. Patients who complain of hypersecretion, with a sense of oppression and headache, are pronounced as having catarrh,

and are recommended to snuff up some stimulating powders or solutions, and trust to time for the disease to wear itself out.

Now, even the most superficial consideration of the anatomy of the parts must convince any one of the comparative uselessness of such a procedure. What have we to deal with? What are the structures concerned? The nasal fossæ are two large, irregularly-shaped cavities, extending from the base of the cranium to the roof of the mouth. They are separated by a thin vertical septum. Each fossa communicates with four sinuses—the frontal above, the sphenoidal behind, and the maxillary and ethmoidal on either side.

Fourteen bones enter into their formation—the frontal, sphenoid and ethmoid, two nasal, two superior maxillary, two lachrymal, two palate, two inferior turbinated and vomer.

The inner surface of the outer wall of each fossa presents three irregular longitudinal passages or meatuses, formed between three horizontal plates of bone that spring from it. These are termed the superior, middle and inferior nasal meatuses.

There are then in both the nasal fossæ, *eight* sinuses, and *six* meatuses.

All of these are lined with delicate mucous membrane (called the Schneiderian or pituitary), continuous with that which lines the middle ear, the eye, and the pharynx.

It would be safe to say that were the lining membrane of all these sinuses and passages extended on a plane, it would cover a surface of several square inches.

Nor is this all. This membrane is provided with mucous glands, which are most numerous at the middle and back parts of the fossæ.

Owing to the thickness of this membrane and its great vascularity, especially over the turbinated bones, the meatuses are very much narrowed, so that even a slight degree of inflammation causes a sense of oppression and stoppage.

After this preliminary study of the anatomy of the parts affected in rhinitis, we are prepared for an intelligent consideration of the treatment.

In the light of what has been said in regard to the structure of the nasal fossæ, the absurdity of the ordinary method

of treatment by insufflation becomes at once apparent. The fluids or powders that are thus snuffed up the nares affect precisely those parts where there is usually the least amount of inflammation. They do not reach, at least but very imperfectly, the upper and back parts of the fossæ where the mucous membrane is thickest and most vascular, and is far more abundantly supplied with glands than at the anterior nares.

The sense of oppression and stoppage, that accompanies the various stages of rhinitis, is due chiefly to the inflammation of the mucous membrane in the upper and back portions of the fossæ, and from these same parts also proceeds the morbid secretion.

The general indications of treatment at once suggest themselves. These are :

1. *To thoroughly cleanse all the passages of the fossæ.*
2. *To restore the normal action of the mucous membrane by appropriate local applications.*

The first and most important indication is best fulfilled by injecting medicated fluids through the posterior nares, with the posterior nasal syringe.

FIG. 11.



POSTERIOR NASAL SYRINGE.

With irritable patients, it is necessary to use some tact, but I have yet to see any adult so nervous or fidgety, as not to submit to the use of the posterior nasal syringe, although for the instant of injection the sensation is always very unpleasant. In very many cases there is not even any need of using the spatula for depressing the tongue.

The one great remedy which is more generally applicable than almost any other, for cleansing the parts in the different stages of rhinitis, is *chlorate of potash*. I inject with the posterior nasal syringe, saturated solutions of this salt

in *tepid* water. The immediate relief it affords, when there is a feeling of oppression and closure is delightful, and ordinary acute attacks of rhinitis can be entirely cured by using it in this way, in a very short time. I regard chlorate of potash as a specific for acute or sub-acute attacks of rhinitis, as well as pharyngitis, when employed in the form of thorough local applications. It is not necessary to graduate the proportions or the number of injections, by any very arbitrary rules.

The effects in each individual case, are our only guide. The solutions should not be so strong, nor the injections so numerous as to cause any protracted smarting. I usually dissolve about half a teaspoonful of the salt in half a tumbler of tepid water, and repeat the injections from two to six times, according to circumstances. I cannot too highly recommend this method of treatment as a curative in all cases of acute or sub-acute rhinitis, and for all acute attacks, that so often and so annoyingly occur during a course of medication for the chronic form. But the beneficial effects of this remedy do not stop here. Chlorate of potash is an excellent cleanser in all grades of rhinitis, and is to be regarded as, on the whole, the best adjunct to our corps of remedies, even for the chronic stages. When administered internally, it has a specific effect on the throat, though not as speedily as when applied locally.

The chlorate of potash is not only more efficacious than any other remedy to fulfil the indication I have mentioned, but it is also very cheap. It has no unpleasant taste or color, and it is harmless to stain as pure water itself.

Permanganate of Potash is also a good cleanser, as well as astringent. Dr. Roosa, of this city, very earnestly recommends it for inflammations of the pharynx, as well as of the nose. The best method of using it is to keep on hand a solution of any particular strength (say gr. x. to $\bar{\text{z}}$ i.) A very little of this dropped into half a tumbler of water will make a solution of sufficient strength.

Tar in a solid form, or as a vapor, has long been used empirically in inflammations of the throat, and usually with results more or less beneficial. Tar water is much used for

rhinitis, both in the form of insufflation and as an injection, with the posterior nasal syringe. Under its persistent use the mucous membrane slowly but perceptibly improves, but for the acute and sub-acute forms of rhinitis, the chlorate of potash is much to be preferred, and even for the chronic stages, tar-water is no more useful, and certainly far less agreeable, than either the chlorate or permanganate.

For all cases of acute or sub-acute, and for very many cases of chronic rhinitis, a complete or approximate cure, or at least a very appreciable improvement can be effected by the use of chlorate of potash alone, or by some other mild, cleansing applications.

The *second* indication is met by a variety of remedies, in the selection and adaptation of which experience is our only guide. Nitrate of silver, sulphate of copper, sulphate of zinc, tr. Iodine, tannin and alum are all good and all bad, according to the manner in which they are used. Intelligent aurists need only to be reminded that chronic inflammation of the mucous membrane of the nose, is to be treated on the same principles as that of the middle ear.

Strong solutions of nitrate of silver, that are so effective when applied to the larynx and pharynx, cause insufferable agony and actual harm when injected into the numerous windings and sinuosities of the nasal fossæ. And yet, nitrate of silver in a solid form, and tr. Iodine undiluted, may be applied to *circumscribed* spots of the nasal cavity with benefit.

We should always endeavor to cure chronic rhinitis by a persistent use of cleansing remedies, but failing in that, to resort to mild astringents or very weak caustic solutions.

My own preference is for *glycerine*, holding *very small quantities*, either of tannin, iodine, or alum in solution.

Weak solutions of nitrate of silver (grs. ii. to ζ i.) I sometimes inject with the syringe, but there are patients who will not bear it. An injection of 4 grs. to ζ i. I have known to cause severe pain for twelve hours.

With sulphate of zinc and copper I have not had very good success. They often seem to aggravate the disease

even when cautiously employed. In a number of instances, I have known the secretion to become thick and yellowish after injection of sulphate of zinc, grs. ii to $\bar{3}$ i.

I had succeeded so well with *creasote* in urethritis, that I anticipated good results from it in rhinitis, but was disappointed. It seemed to be of no special service, and the odor was so offensive and so abiding that the patients implored me not to use it again.

The fluids that are injected with the posterior nasal syringe should always be moderately *warm*. This precaution is of more importance than might at first appear, for the inflamed mucous membrane of the parts is often so sensitive and irritable that the application of cold solutions of any medicament whatever is more injurious than beneficial. In cold weather it is best to warm the glycerine before using, and at all seasons, tepid water should be used for the solutions. When chlorate of potash is used, it is doubly important that this rule should be heeded, because this salt is not sufficiently soluble in cold water. This precaution in regard to warming the injections is fully as necessary in the treatment of nasal as of aural affections.

Inhalations are at present much in vogue, and may be used for the nasal passages as well as for the larynx, pharynx, and trachea. That vapors of iodine, tar, will affect the lining membrane more thoroughly than the insufflation of fluids or powders, is not to be doubted, and yet they are hardly to be relied on for the cure or even for the permanent relief of any long-standing rhinitis. The momentary relief they afford is often very agreeable, but they cannot cleanse the parts as efficiently as the injections made with the posterior nasal syringe.

Of the *modus operandi* of administering inhalations in general I shall speak in more detail farther on.

A good method of inhalation at home, is for the patient to breathe through his nostrils the vapor from a cup of hot water, into which a little iodine has been dropped.

I have sometimes employed with apparent advantage the

fumes of muriate of ammonia, mingled with iodine vapor. For this purpose Buttles' inhaler is attached to rubber tubing, connected with a flask, such as aurists use for sending vapor through the eustachian catheter into the middle ear. The inhaler contains a sponge saturated with tincture of iodine, and the flask contains a little of the muriate of ammonia, that is heated by a spirit lamp until fumes arise. By pressure on the bag connected with the flask, the fumes of the heated ammonia, and the vapor of the iodine are forced into the nares.

Thudicum's or Weber's method of cleansing the nasal passages deserves at least a mention, on account of the popularity that at one time it was thought it would acquire.

His apparatus consists simply of an ordinary glass funnel, or bottle, with the extremity or mouth of which a piece of rubber tubing is connected. To the other extremity of the tubing there is attached a small, bulbous-shaped rubber nozzle, through which the water runs into one nostril and out at the other.

In using the apparatus, the vessel containing the water, or solution, should be suspended to an iron stand on a table, somewhat higher than the head of the patient while in a sitting posture. When all is ready, the patient leans considerably forward, holding his mouth widely opened, and breathing as quietly and naturally as possible, while the operator lets on the water through the tubing, by turning a stop-cock that is inserted in its middle portion. The vessel attached to the stand being more elevated than the head of the patient, the water forces its way by hydrostatic pressure through one nostril into the upper part of the pharynx, and flows out through the other, thus cleansing all the parts of the nasal fossæ with which it comes in contact.

The theory of this operation is so charming that we can hardly wonder that so much was at first expected of it. But in the way of its successful employment, there are a number of trifling difficulties that together interfere very decidedly with its practicability. The theory is that when the mouth is stretched widely open, the uvula and soft palate press against the posterior wall of the pharynx, so as to close the cavity,

and that thus the fluid is compelled to seek an outlet through the nares.

But as a matter of fact, this closure is very often but partially made, and then the water runs into the mouth. Again, when the fossæ are much narrowed by inflammation, the water will not even flow through one nostril without persistent coaxing and management. Furthermore, there are patients to whom this operation is so very painful, causing such protracted sneezing and smarting, that rather than submit to it through a long course of treatment they prefer to endure the disease.

But, after all, the chief objection to this operation is, that even when satisfactorily performed it does not accomplish the purpose designed, as well as the injections made with the posterior nasal syringe. It must be manifest to any one that it cannot cleanse all the meatuses and sinuses as thoroughly as a full stream injected against the posterior nares, and allowed to flow out on both sides.

Thudicum's method, therefore, being uncertain and sometimes painful in its operation, being inconvenient both for the physician and patient, and not sufficiently thorough in its effects, has nothing to commend it over the simple naso-pharyngeal syringe.

Electricity I have found to be a very pleasant and useful adjuvant in the treatment of rhinitis, as well as in inflammations of the air-passages in general. If used alone, without any other treatment, it affords very decided and oftentimes permanent relief, but rarely works a cure. My method of employing it will be fully detailed in the next chapter.

Local abstraction of blood by leeches is sometimes of service in the various stages of rhinitis.

The system or course of treatment that I adopt and recommend for rhinitis may be thus summed up:—

For acute and sub-acute attacks, injections of solutions of chlorate of potash.

For the chronic forms:

1. *Either the chlorate of potash or the permanganate in very weak solutions, or tar-water.*

2. *Glycerine, either by itself, or holding in solution very small quantities of tannin, alum or iodine.*

All these solutions are to be made tepid and injected with the posterior nasal syringe, from three to five times a week.

3. *General, partial, or localized Electrization.*

If the general condition be feeble, then in addition to local treatment, constitutional tonic remedies and careful hygienic management are indicated.

In inflammations of the pharynx and larynx, we may often use with benefit the very strongest caustic solutions, even though they may cause very great annoyance; but in rhinitis, applications of any substance whatever, that cause protracted smarting or very profuse discharge, will do more harm than good. The cardinal maxim in the treatment of inflammations of the nose, as of the middle ear, is, that nature must be coaxed, and not driven.

Chronic morbid processes of mucous membranes work slowly in their recession as well as in their advance, and any attempt to force them by heroic measures must end in failure. But in spite of this fact, in spite of the relapses that will often and unavoidably occur on exposure to dampness and cold, rhinitis is as susceptible to treatment as any analogous affections in other parts of the body.

But here, just as with mucous membranes everywhere, chronic inflammation that has been entirely or approximately healed, is very apt to leave behind it a tenderness and susceptibility that render it necessary to exercise habitual, life-long attention.

In very severe, long-standing cases, in old and feeble individuals, we can only hope to afford decided relief, and prevent the disease from making further progress.

There is always danger that the inflammation may find its way through the eustachian tubes into the middle ear, and of this we should never fail to warn our patients.

In the great majority of cases there is more or less pharyngitis associated with the rhinitis, and this will be best treated by touching with solutions of the nitrate of silver, according

to the principles laid down by Dr. Tobold in the treatment of laryngitis.

Cases of *œzena*, dependent on ulcerations, are to be combatted with the same weapons as the simple rhinitis. When the disease proceeds from syphilis, constitutional treatment is indicated, in addition to the use of the cleansing agents above named, and the ulcerated spots, if they are accessible, may be touched with the solid nitrate of silver. Polypoid growths, and other new formations occurring in the nasal passages, are to be treated on the same general principles as kindred affections in the larynx.

CHAPTER X.

INHALATIONS.

Recent History of this Method of Treatment.

THE old and highly lauded method of treatment of diseases of the respiratory passages by inhalations, has been revived of late with so much of enthusiasm and energy, that it is no more than proper that it should be assigned a special chapter in a work on the diseases of the throat. The extravagant hopes that were entertained of inhalations, not only in bronchitis, but in the advanced stages of consumption, and the exaggerated statements that were made in regard to their efficacy in these disorders produced a want of confidence in their virtues on the part of truly scientific men, and after a time the system fell into almost utter disuse in the profession. It then experienced the fate of nearly all the prominent specialties of the day, such as ophthalmology and surgery, the venereal, gynecology and electricity. Driven from the halls of science, it was espoused by charlatans, pretenders and ignorant outsiders. In these latter days it has been readmitted into the society of the learned, and bids fair to receive whatever of attention it justly deserves, at the hands of our leaders in therapeutics.

The history of the modern system of treatment by inhalation, dates from Sales-Girons, who first proposed to atomize fluids by causing them to strike with great force against a metallic disk.

At first a number of patients were accustomed to inhale at the same time, in a large room, at a watering resort; but shortly after he devised an apparatus composed of a vessel

filled with some solution, and an air-pump attached for compressing the air on the surface of the fluid.

Since that time various forms of apparatus have been constructed, by Lewin and others, on substantially the same principle as that of Sales-Girons, namely, the atomizing of fluids by forcing them against some hard surface.

In the nephogene, air and water are intermingled in a ball, and by pressure are driven out of a small opening in the form of spray.

Dr. Bergson first suggested the idea of atomizing medicated solutions by making use of the principle on which the toys sold in the shops for odorizing apartments are contrived. Two glass tubes with very small openings, are placed at right angles to each other, the upright tube being directly opposite and very close to the opening of the other. When air is forced through the horizontal tube by compressing a rubber ball, or by blowing with the mouth, or in any manner whatever, the air in the other tube becomes so much rarefied that the fluid in which it is dipped will rise through the opening and become pulverized.

On this principle have been constructed a very great variety of apparatus for atomizing medicated solutions, and for directing the spray into the nostrils, the pharynx, larynx, eustachian tubes, and other parts of the body. Richardson's famous device for inducing local anesthesia is constructed on this principle.

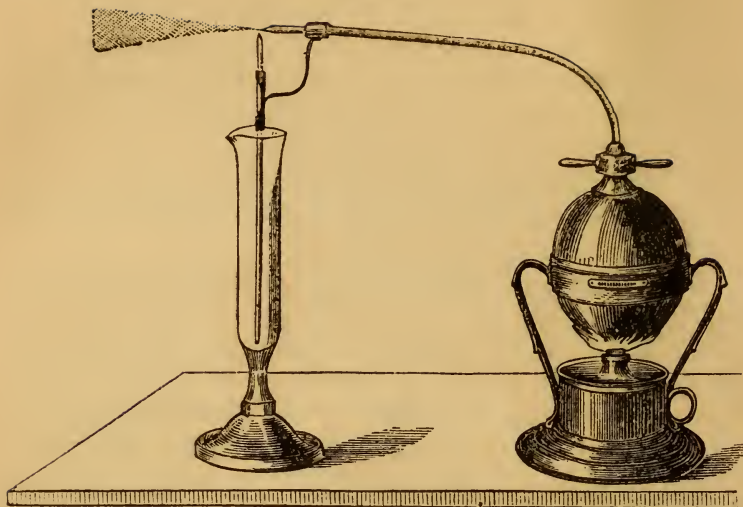
But it was reserved for Siegle to devise an apparatus for inhalation that is at once more simple and more convenient than any that had been previously known.

He employed tubes with minute openings, as suggested by Bergson, but substituted the pressure of steam for that of air.

This apparatus is variously constructed, according to the fancy of different makers; but the three essentials are, a boiler, with a spirit lamp beneath; two tubes attached, arranged on the principle of Bergson; and a vessel to contain the solution in which the upright tube is suspended.

An apparatus of this kind is represented in the following figure :

FIG. 12.



SIEGLE-BERGSON'S APPARATUS FOR INHALATION.

This is the apparatus that I chiefly employ and recommend for the ordinary purposes of inhalation; although it is, probably, no better than any other instrument carefully arranged on the same principle. This form of apparatus has the following advantages over that of Bergson, where compressed air is the motive power:

1. The patient can take the inhalations himself, without the immediate superintendence of the physician, or of any other assistant.

2. The spray is of a warm temperature, and may fulfil indications that could not be met by cold inhalations.

The management of this apparatus requires no great skill, but considerable attention. The boiler should be kept about two thirds filled with water, and the tapering extremity of the vertical tube in the solution should be firmly fixed close to, and just opposite the centre of the capillary orifice of the horizontal tube that conveys the steam.

The effect of the warm spray is to relax the tissues of the respiratory passages, and to render them temporarily suscep-

tible to the cold. For this reason, patients should be directed to avoid exposing themselves out of doors, for ten or fifteen minutes after taking a warm inhalation from this or from any similarly constructed apparatus. A glass cone usually accompanies the different forms of Siegle-Bergson's apparatus. It serves the double purpose of protecting the face and depressing the tongue, so as to direct the spray into the cavity of the mouth.

FIG. 13.

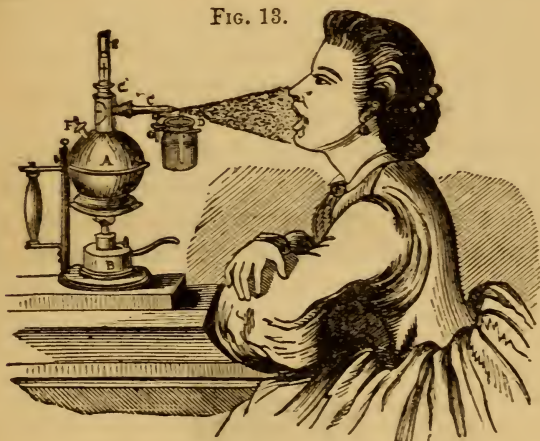
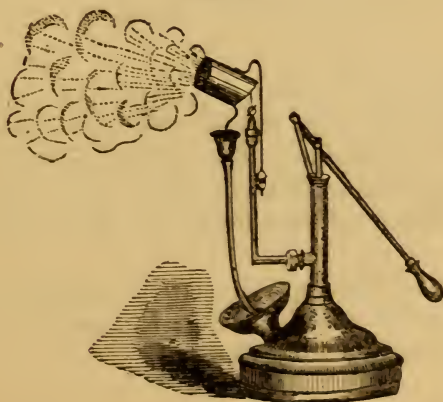


Figure 13 represents Siegle's apparatus, with water-gauge and valve.

FIG. 14.



PUMP ATOMIZER.

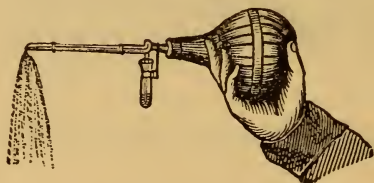
These modifications are no improvement over the preceding. The apparatus is, however, quite simple, and easily managed.

In the instrument represented in figure 14, the air is compressed by means of the pump, and the stream of water strikes against the inner surface of the metallic tube, or cylinder, and is thrown into fine spray, according to the idea first suggested by Sales-Girons.

The advantage of this and similarly constructed inhalers is, that the spray is entirely cold, and therefore the patient need not fear immediate exposure after employing them.

On the other hand, the working of the pump requires the superintendence of the physician, or of some other assistant, and is at best a disagreeable task. Moreover, there are certain diseased states of the mucous membrane, in which warm inhalations are more soothing, and very likely more efficient, than cold.

FIG. 15.

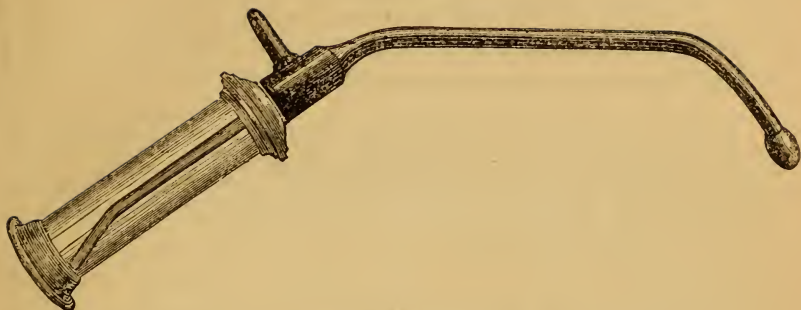


MAUNDER'S SPRAY PRODUCER.

This consists of a rubber bag, with a perforation on one side, so that it can be refilled with air instantaneously, as often as it is emptied. The spray is produced by forcing the air through the tube connected with the bag over the minute orifice of another small tube containing the solution.

This instrument is useful in certain diseased states of the mucous membrane of the pharynx and larynx, when but a small quantity of fluid is required.

FIG. 16.



LARYNGEAL ATOMIZER.

Figure 16 represents a laryngeal atomizer of another form. For applications to the vocal cords, or the trachea, it is very convenient. In the principles of its employment it does not differ from those previously described. Let it be understood that these figures are merely designed to illustrate the principles on which instruments for inhalation are constructed. To describe all the modifications of these that have been devised, would require many pages.

RULES TO BE OBSERVED IN THE EMPLOYMENT OF INHALATIONS.

1. The patient should sit in front of the instrument, at a convenient distance, so that it will be necessary to incline the head but slightly forward.

2. A conical shield, one extremity of which should be small enough to enter a little distance into the mouth, should be used, both for convenience and for the purpose of directing the the spray over the tongue, into the pharynx.

3. The patient should breathe easily and comfortably, so that the operation may not become tiresome. An occasional deep and prolonged inspiration is advisable where it is desired to reach the bronchial tubes, or the lungs. The coughing that often arises, will in some cases be annoying, and may continue for a little while after the inhalation is over.

4. The duration of a sitting may be from five minutes to

half an hour, according to the nature of the disease, the constitution of the patient and the character of the remedy employed. The sittings may be repeated daily or twice a day, or less frequently, according to circumstances.

5. The treatment by inhalation, if employed at all in the chronic affections of the air-passages, must be persistent. At least, it must be used as perseveringly as other local medication for the same affections.

DOSES OF THE SUBSTANCES USED IN INHALATIONS.

In former times tar and turpentine were the substances chiefly employed in inhalations; in these latter days a large variety of substances have been employed, in different strengths and combinations.

It is impossible to lay down arbitrary rules in regard to the administration of remedies by inhalation. The substances employed and the strengths of the solutions must be adapted, and varied according to each individual case. In estimating our doses it should be considered that in Bergson's apparatus, but a little more than a quarter of the fluid enters the mouth, however steadily the patient breathes; and even in Siegle's apparatus, the spray is diluted by the steam, while between one quarter and one half of the combined pulverized fluid is lost before it enters the mouth.

As a rule, the doses of very powerful substances should be regulated with more care than when they are administered internally, inasmuch as it is impossible to determine precisely to what extent they will be absorbed.

Tannin, chlorate of potassa, muriate of ammonia, and alum, may be used in solutions varying from 5 to 30 grains to the ounce; nitrate of silver and sulphate of zinc from 1 to 8 grains; tincture of opium from 5 to 10 drops; perchlorate of iron from $\frac{1}{4}$ to 2 and 3 grains. Tincture of iodine 4 to 20 drops.

We may also use sulphate of copper, conium, hyosciamus, liq. sod., chlorinat., turpentine, and almost anything that is soluble in water or in alcohol.

One of the best combinations that I know of, and one that meets a very wide range of indications, is equal parts of tar water and camphorated tincture of opium. Instead of the camphorated tincture, a proportional quantity of laudanum may be substituted.

The different preparations of opium may also be combined with alum, tannin, and other substances. The effects of this narcotic, and of all other powerful remedies should be carefully watched, when the treatment is at all protracted.

The inhalation of oxygen gas has of late attracted considerable attention, and there is reason to believe that in some conditions it is of excellent service.

THERAPEUTIC VALUE OF INHALATIONS.

Without entering into any extended discussion of the various questions that have arisen on this subject, I may sum up what I regard as established in regard to the therapeutics of inhalations, in the following propositions.

1. In the different stages of rhinitis and in ulcerations of the nasal passages, inhalations of tar water, chlorate of potassa, and tincture of iodine, or muriate of ammonia, are very pleasant *adjuvants*, but *are very far inferior in efficacy* to cleansing applications made with the naso-pharyngeal syringe. These substances, however, permeate the nasal cavities far more thoroughly when used in the form of vapor, than when snuffed up in solutions.

2. In pharyngitis and laryngitis, the treatment by inhalation of the above-mentioned substances is a very charming *placebo*, and may prove curative as much by its psychical as by its soothing or alterative influence. When used immediately after irritating applications of caustic solutions, inhalations of tar water, and a number of other solutions variously combined with opiates, have a very quieting effect, and very decidedly mitigate the unpleasant features of local medication.

In chronic inflammations of the pharynx and larynx, inhalations of iodine and caustic solutions are far less efficacious than are the same substances applied directly, with the sponge or pencil, or even with the syringe. Although the atomized fluids may reach some parts that the probang or pencil do not affect, and may be far more agreeable to the patient, they yet cannot be relied on for the cure of any but very slight and recent inflammations of these parts.

In a word, for all parts above the vocal cords, inhalations, however varied, are chiefly useful as adjuvants.

3. In inflammations of the trachea and bronchial tubes, that are not so directly within reach of local applications, the relative value of inhalations is more apparent, although even here the results are usually slow and uncertain.

4. In the first stages of phthisis, inhalations of iron and iodine are quite beneficial, but whether by virtue of their local or constitutional influence, it is impossible to determine.

In the treatment of pulmonary hemorrhage, inhalations of very strong solutions of alum or Monsel's salt, are often speedily efficacious.

5. In whooping-cough and asthma, inhalations have rather disappointed the hopes that were formerly entertained of them.

6. For those patients who will not or cannot submit to the topical applications of caustic solutions with the sponge and pencil, it may be well to advise the persistent employment of inhalations at home; but the extravagant hopes usually entertained in such cases will be disappointed.

7. Partial electrization, according to the method described in the chapter devoted to that subject, has fully as soothing an influence on irritated states of the mucous membrane of the respiratory passages as inhalation, and has the following additional advantages:

(a) It has a permanently tonic and curative effect on the diseased parts.

(b) It does not take as much time, nor cause as much annoyance, as preparing for and using inhalations.

(c) The patient, after electrization, can expose himself to the out-door air, without any risk whatever.

For these reasons I have dispensed with inhalations in a measure, since I began to use electrization, and find the results more satisfactory.

On the other hand, it should be stated that electrization must be employed by the physician in his office, while inhalation is, *par excellence*, the domestic remedy, and after the preliminary instruction has been given, can be pursued entirely at home.

CHAPTER XI.

GENERAL, PARTIAL, AND LOCALIZED ELECTRIZATION IN DISEASES OF THE AIR-PASSAGES.

HAVING always been educated in the belief that electricity was injurious in inflammations, I was quite slow to accept any evidence to the contrary. Accordingly, I had for some time been employing general electrization as a tonic in neuralgia, rheumatism, dyspepsia, chorea, and other affections associated with general debility, before I observed that patients affected with inflammations of the air-passages received temporary or permanent benefit from the applications. At first, I attributed this improvement entirely to the constitutional tonic effects of the electrization, not believing it probable that it could have any special local influence on the diseased mucous membrane; and it was not until after I had commenced the study of laryngoscopy, that I tested the matter by repeated experiments.

I found that of the patients affected with rhinitis, pharyngitis, laryngitis, and bronchitis, those upon whom electrization was employed as an adjuvant progressed more rapidly than those upon whom it was not, and that too, where the applications were mainly confined to the neighborhood of the affected part, and, consequently, could have but very little effect on the general system. Nor was this all. I found that electrization often proved of very substantial service, even when no other treatment was employed. The same results were observed under similar cases under the care of my associate, Dr. A. D. Rockwell.

Accordingly, I have since employed either general, partial or

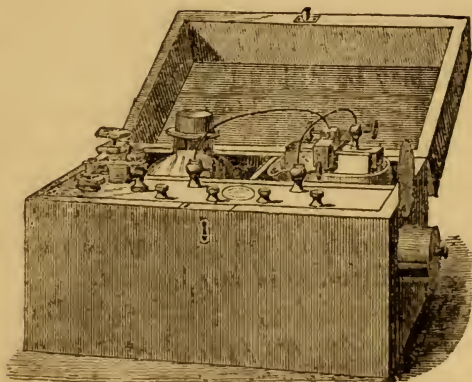
localized electrization as an adjuvant in the treatment of the various forms of inflammations of the air-passages, and with pleasing results. I usually apply the electricity at the close of the visit, after the sponging and syringing are completed. The immediate effects are to quiet the irritation caused by the touching with the nitrate of silver, and the patient leaves the office in a comfortable frame of mind and body.

The power of electrization in stimulating indolent ulcers to a healthy action has long since been demonstrated by a number of observers. That it should also be of service in the treatment of chronic inflammations of mucous membranes, is, to say the least, nothing more than consistent with its recognized effects on inflamed conditions of other tissues.

In acute or chronic urethritis, in inflammation of the middle ear, and ulceration of the membrana tympani, we have found electrization to be of service, not only as an adjuvant to the other treatment, but also of itself alone, especially when the applications are made all over the body as well as on or near the part affected.

The apparatus that I employ for electrization is the electro-

FIG. 17.



magnetic machine manufactured by Jerome Kidder, of this city. Having tried a number of machines of home and foreign

manufacture, I am convinced that this is on the whole the best electro-magnetic apparatus that has yet been devised.

It is run by the ordinary Smee's battery—one element, or at most two, being sufficient—or by Farmer's neat and beautiful thermo-electric battery. The helix is constructed so as to furnish several different currents, that may be varied or combined by the operator, according to the indications. The armature for interrupting the current is so constructed that it never fails to work if the apparatus be even in tolerable order. The ordinary metallic holders that accompany the apparatus, we do not use or recommend. They are only serviceable when a bystander wishes to test the power of the machine. For general electrization, I attach to an insulated wire, connected with the positive pole, a hollow brass ball firmly and neatly covered with soft sponge, that is always to be thoroughly moistened when used, in order that the conducting power may be as great as possible. To the insulated wire connected with the negative pole, is attached a sheet of copper, on which the feet of the patient rest during the application.

To secure the best possible connection, this sheet of copper should also be sprinkled with tepid water.

The strength of the current can be modified by increasing or diminishing the strength or quantity of the acid solution in the battery. It may also be modified by withdrawing or pushing in the metallic tube that incloses the helix with the bundle of soft wires. It may be still further and more delicately modified by increasing or diminishing the pressure of the hand on the sponge of the positive pole. In this way, better than by any system of localized electrization, or by any kind of artificial electrodes, the dose of electricity can be graduated according to the strength of the patient, the nature of the disease, and the sensitiveness of any locality.

In localized electrization, as practised by Duchenne and his followers, the electrodes are applied near to each other over individual muscles or the nerves connected with them, and the current is supposed to traverse only the intervening space.

In general electrization the current traverses the whole system, affecting either by direct or reflex action, or by both,

not only the muscles of the trunk and extremities, but also the tissues of the stomach, lungs, liver, and all the vital organs. Judging from the rapidity of the exhilaration produced by it, and the permanency and thoroughness of its tonic effects on the constitution, it would seem that it acted directly, or by reflex action, on the great sympathetic.

Upon the various and plausible theories of the action of electricity used in this manner it is needless to comment, nor do I care to detail in this connection the various physiological experiments that have from time to time been instituted by different observers. Interesting and pleasing as they are, they afford little information in regard to the rationale of electrization in the cure of disease.

Judging from the effects of active exercise, and the "movement-cure" in chronic affections, the theory seems to be plausible that the action of general electrization is chiefly mechanical. No agents so well as the electric currents can penetrate the hidden tissues of the vital organs, and all the muscular and ligamentous structures. It exercises every fibre in a manner that can be easily proportioned to its capacity, and stimulates to a healthy action the vessels, nerves and organs concerned in the complicated process of waste and repair.

In the employment of general electrization there are certain rules and details on the observance of which the success of the applications will very materially depend.

The sponge covering the ball electrode must of course be wet, and the hand should be repeatedly moistened while making the applications.

For the negative electrode I use a sheet of copper on which a little *tepid* water is sprinkled.

Salt water is a better conductor than fresh. The proper adjustment of the armature so as to obtain a current fine or coarse, as soothing or exciting effects are indicated, requires considerable management, and can be learned only by practice.

2. The *primary*, or immediate effects of general electrization, when properly graduated to the strength of the patient, are a feeling of *exhilaration* very much as is experienced after

taking a bath, or after a brisk walk in the open air. Neuralgic distress is sometimes instantaneously dissipated, and for a few hours there may be a disposition to sleep.

3. The *secondary effects*, that do not usually appear until the following day, vary in different individuals and in different states of the system. At the outset of a course of treatment patients sometimes complain of a feeling of depression, and of soreness in the muscles.

These unpleasant sensations, however, are exceptional, rather than the rule, after judiciously regulated applications, and the *permanent tonic effects* begin to manifest themselves through the entire system. The capricious appetite becomes keener, the constipated bowels grow more regular, and the sleep is easier and more refreshing. The muscles often increase in size and hardness, and there is greater capacity of endurance.

These effects should be carefully distinguished and recognized by the operator as they occur, and the patients should be forewarned, particularly with regard to the secondary symptoms, in order that they may be spared unnecessary alarm.

4. The length of each *seance*, the strength of the current used, and the intervals between the applications, should be graduated with the most studious care, according to the constitution of the patient and the nature of the disease. The applications may vary in duration from five minutes to half an hour, or even longer.

In the administration of no remedy is there as wide a range in the susceptibility of different patients and so imperative a necessity for caution and judicious adaptation to each individual case, as in the employment of general electrization.

In the very weakly, and especially in the very aged, not only should the applications be very short, but the current used should be very mild, and of as fine and soothing a quality as can be obtained from the apparatus. Furthermore, all who are specially nervous or impressible should not receive applications oftener than two or three times a week at most, and if

any depressing or otherwise unpleasant effects occur, there should be still longer intervals.

To these rules there are some exceptions on both sides. We meet with quite delicate females who can bear the strongest currents, and there are those otherwise vigorous upon whom the gentlest application works disagreeably. For this reason we should proceed cautiously with all cases, at the outset of a course of treatment, until the susceptibility to the electric currents has been fairly tested. It should also be stated that the amount of electricity that can be borne without injury varies in the same individual on different days and different hours of the same day, according to the state of the system and the conditions of the atmosphere.

The effects of the treatment by general electrization, will depend very materially on the *thoroughness* with which the applications are made. In this, more than in almost any other therapeutical process, careless, indifferent, and unwise timidity will produce results unsatisfactory both to the physician and the patient. The simple mechanical art of making a general application of electricity requires much greater skill, patience, and experience, than will be appreciated by those who have not essayed it by actual experiment.

PARTIAL ELECTRIZATION.

By this I mean the application of the electric current around the head and neck, with the positive pole, while the hands are placed on a moist sponge or small sheet of copper to which the negative is attached. Used in this way, the current traverses the tissues of the neck, affects the mucous membrane of the air passages, and may also be transmitted to the digestive organs through the pneumogastric nerve.

This is the method of electrization that is indicated as an adjuvant in throat affections of the pharynx or larynx that are neither dependent on nor associated with general debility, when only the local, tonic and soothing effects of electrization are indicated. Here, even more than in general electrization, the hand

is to be preferred to any artificial electrode. I usually allow the patient to rest both hands on the sheet of copper to which the negative pole is attached, or grasp firmly a sponge-covered electrode, while with the hand I apply the positive around the neck on every side, pressing the fingers firmly between the muscles against the thyroid cartilage and trachea, and in the direction of the sympathetic and pneumogastric nerves.

This method of application has a very quieting and tonic effect on the irritated and inflamed mucous membrane, and those on whom it has ever been employed desire to have the applications repeated. My custom is to use partial electrization after the application of caustics or other irritants, in order to relieve the very annoying pain that they so often cause, or in any irritable condition of the parts. I cannot too strongly insist upon the use of partial, or of general electrization, in those frequent cases of sub-acute and chronic bronchitis, that so often prove rebellious to internal medication. It not only has a soothing influence on the irritable mucous membrane, but when repeated with a measure of perseverance, it may work an entire cure unassisted by other treatment. For inflammations of the trachea and bronchial tubes, the positive pole should be applied around the neck on every side, but more particularly just above the sternum, between the sterno-cleido mastoid muscles. There are very few who are so sensitive that they cannot bear a current of considerable strength in this locality, when the hand is used as an electrode. Instead of moving the hand, as is customary in electrization, it may be allowed to rest for two and three minutes at a time, below the thyroid cartilage. When the electric currents are thus passed through the lower air-passages, they usually give rise to a tickling sensation and a disposition to cough. This temporary irritation, however, is followed by a sense of relief that often lasts for hours.

Although I have thus treated of partial electrization, distinctively and in detail, yet in the great majority of cases, especially those complicated with indigestion or general debility, general electrization, with the negative pole at the feet, is far

to be preferred, for the reason that the current affects the whole system as well as the air-passages, and that too, when the applications are confined to the region of the neck. The only argument that can be adduced in favor of placing the hands instead of the feet at the negative pole, is that thereby we save the trouble of removing the shoes and stockings.

LOCALIZED ELECTRIZATION.

In this method of application, one electrode is placed on the back or side of the neck, and the other is applied directly opposite, or is swept around in different directions. Sometimes the applications are made directly to the mucous membrane itself, by means of a covered electrode, with a sponge-tipped extremity. Of late, however, I have almost entirely abandoned localized electrization, in favor of the method above described, and for the following reasons :

1. Its operation is not as thorough, nor are its effects as permanent.

The reasons for this are very evident. In localized electrization, as practised by Duchenne and his followers, the effects of the current are mainly confined to the tissues lying between the electrodes, and consequently there is lost all the constitutional tonic effects that might be secured in conjunction with the local influence. Except when it is desired to produce contraction in some single, isolated muscles, that have been paralyzed, perhaps for a long time, general or partial electrization will accomplish directly on the parts as much or even more than localized, and at the same time impart vigor and strength to the whole system. Naturally, this improvement of the general condition reacts on the diseased part, whether it be the eye, the ear, or the throat, or any organ whatever, and the final results are oftentimes more complete and more lasting than any amount of merely localized electrization could have achieved.

Intelligent aurists, oculists, laryngologists, gynecologists, or general practitioners who have to do in any way with

diseases of the ear, eye, throat or uterus, need not be reminded of the great difficulty and frequent impossibility of curing the affections of these parts without attending to the general system.

Let it be granted, what I have long since demonstrated, that electrization is a *tonic*, and the superiority of general over local applications is at once apparent, for all those cases where the morbid state is dependent on, or associated with general debility.

2. Localized electrization, especially when either pole is applied directly to the mucous membrane, is a procedure at once painful and disagreeable.

Mucous membranes are very sensitive to the electric currents, as well as to the mechanical pressure of the electrodes. There are many who will not endure, even for a moment, the pressure of either a sponge or a metallic electrode in the larynx, or even against the posterior wall of the pharynx. This is true, indeed, of the majority of patients. More than once I have seen vomiting excited by the combined irritation of the electrode and the current.

Again, it is a law of electrical action, that the smaller the surface of any electrode, the intenser the pain that will be excited, the strength of the current remaining the same.

Therefore, as only small electrodes can be introduced into the pharynx or larynx, the pain of an application internally must be far greater than when the hand or sponge is applied to the integument, even when there is no difference in the sensitiveness of the parts.

To sum up in a single sentence, *a very strong current on the surface of the neck, made with the moistened hand, in general or partial electrization, is more effective, temporarily and permanently, on the inner tissues of the throat, more agreeable to the patient, and more convenient for the operator, than the mildest current applied directly on the mucous membrane itself.*

In cases of aphonia, however, the galvanic stream applied against the vocal cords, over the laryngeal nerves, or on the muscles and cartilages by means of the laryngeal galvanizer, or some similar instrument, may produce contractions, and thus

may restore the voice sooner than could be done by any kind of external application.*

* For the benefit of those who have not given the subject special attention, it may be well to explain that faradaization refers to the use of the secondary or *induced* current, and galvanization to that of the galvanic, or "*continuous*." Those who may feel interested in investigating the subject of general electrization, may find explanations of some of the terms used in electro-therapeutics, with various illustrated cases, in a treatise on "*The Medical Use of Electricity*," recently published by A. D. Rockwell and myself. The best of the more recent writings on "localized electrization" are those of Rosenthal, Prof. Ziemssen, Meyer, Tripier, Althaus, and Garratt.

In the appendix will be found descriptions of various forms of apparatus that it was thought best not to introduce in the body of the work. There is also added the minute anatomy of the soft palate and pharynx, that may be of service to those who are specially interested in laryngology.

CHRONIC DISEASES OF THE LARYNX.

CHRONIC DISEASES OF THE LARYNX.

INTRODUCTION.

ON THE POSSIBILITY, UNDER ALL CIRCUMSTANCES, OF MAKING AN
EXACT LARYNGOSCOPIC DIAGNOSIS.

SINCE laryngoscopic diagnosis lies at the foundation of our work, as the more certain basis in the treatment of diseases of the larynx, we may be allowed to say a preliminary word upon the possibility of a method of investigation that may be entirely successful, because, on this point, even at the present day, very erroneous opinions are entertained. Many physicians who rarely have the opportunity to practise with the laryngeal mirror, think that laryngoscopic investigation is, with many patients, connected with endless difficulty. They suppose that the laryngeal mirror must be introduced at various times, and at repeated intervals, before we finally succeed in overcoming the irritation of the patient, and his tendency to vomit, which always occurs; nay, more, that in certain cases the introduction of the laryngoscope, and obtaining thereby a diagnostic result, may be absolutely impossible.

This prejudice, which results merely from want of practice and skill, I must very decidedly oppose.

The difficulties that interfere with laryngoscopic investigation are more the fault of the physician than of the patient, however irritable and awkward he may be. If an inclination to vomit is excited through the application of the laryngoscope, the cause of it certainly lies in its faulty and violent introduc-

tion. It depends merely upon the skill and facility of the examiner, even in cases manifestly of the greatest difficulty, whether he makes immediately, and without any irritation to the patient, an absolutely accurate diagnosis.

The foundation principles of laryngoscopy are these :

Forced laryngoscopy never succeeds.

The person to be examined must be well instructed, before the introduction of the mirror, to sit face to face with the examiner, and to inspire and expire quietly.

The laryngoscopist himself must introduce the instrument, with light and facile hand, without injuring any of the parts of the larynx.

A forced procedure leads, in every case, to a negative result.

We do not believe that the irritable patient becomes accustomed to the forcible application of the mirror. A faulty introduction, and the choking caused thereby, is never to be remedied by changing the position and holding of the mirror which has been once introduced. The mirror must be promptly withdrawn, and the second introduction must be better managed.

This is not the place in which to give instruction on laryngoscopy. It may, however, be allowed to me, after my experience obtained in the laryngoscopic instruction which I have given in the past year, to dwell on those points where there is the greatest deficiency, and the non-observance of which can give rise to the unfounded assertion, that laryngoscopy is, in many cases, impracticable.

First of all, the physician must not expect that, with the procuring of an illuminating apparatus, capability and skill in laryngoscopy will at once be conferred on him. The successful use of the laryngeal mirror demands, besides some dexterity, a great amount of practice, and, next to that, the power of overcoming, in a skilful manner, the special difficulties of the cases that present themselves, particularly the awkward and resisting grimaces of the patient, and the excessive irritability of the throat.

With regard to the latter point, I must very particularly

insist upon a scrupulously careful observance of all the rules regarded as important in acquiring the laryngoscopic art. Above all, the brilliant cone of light must be kept for a long time in a good position; the head of the patient must not be displaced, through the zeal of the examiner, and the mirror must, with rapidity, and yet with sufficient certainty, have a fixed position, anterior to the middle of the uvula.

The greatest mistake will be in the proper holding of the mirror. It will either be held too high, so that the uvula comes to view beneath its border, or it will be allowed to wander about on the pillars of the soft palate, exciting thereby an uncontrollable tickling sensation. Another error is to allow the mirror to glide too far under, and to irritate, in this way, the deeper and more sensitive parts of the mucous membrane of the throat. So far as the instruction of the patients in their co-operative efforts during laryngoscopy is concerned, we cannot presuppose one and the same grade of facility and want of sensitiveness with all who are to be examined. There are patients who, after very brief instruction in the necessary holding open of the mouth, continue in the most careful manner the forcible and uninterrupted stretching out of the tongue, and regular respiration and inspiration. And to this class belong even patients who are of the lower walks of life. Others need instruction beforehand upon the observing of points already named, before the introduction of the mirror can be successful. It is necessary, therefore, for us not to neglect, before or during the examination of such patients, to remind them anew of this important procedure. Especially must the regular respiration be particularly remembered, during the examination. The cavity of the larynx, in a certain measure, opens itself only when the patient, who up to that point has held his breath, is finally brought to regular inspiration and respiration. When the epiglottis lies firmly back, the patient must be instructed, after a deeper inspiration than usual, to endeavor to give a high intonation with rapidity, and, as it were, by fits and starts. The epiglottis heaves itself at that moment so much, that the cavity of the larynx comes sufficiently into view.

In cases which are especially difficult, that is, when the patients begin to choke, as soon as the tongue is extended (to this class belong especially those patients affected with serious inflammation of the pharynx), the examiner must, with an anxious regard for all the technical rules already enjoined and considered to be of value, introduce the mirror only for an instant, very quickly and skilfully, so as to snatch in a hurry, as it were, the pathological image of the larynx.

Whoever observes this principle with care, will succeed in bringing every case, without great difficulty, to the wished-for diagnostic conclusion. Absolute impossibility of examination can exist only in young children, inasmuch as these do not carefully fulfil the indispensable demand of voluntary co-operative effort—the forcible outstretching of the tongue, and gentle inspiration and expiration.

SECTION I.

HISTOLOGY AND PHYSIOLOGY.

Cartilages and Ligaments of the Larynx.

THE special importance of the inflammatory processes belonging to the forms of disease, will very distinctly appear, if we briefly describe the histological formation of the principal parts of the larynx. For a special study, I recommend the detailed work of Luschka.

The cartilages of the larynx consist of *true cartilaginous tissue, of fibrous cartilage, and of elastic or yellow cartilage*. The thyroid, cricoid, and arytenoid cartilages are formed out of ordinary cartilaginous tissue. This consists of a bluish white porous substance, somewhat hyaline, with flattened cells on the periphery, then of a deeper, whitish layer of small round mother cells, and within of a basis substance, with small cavities.

The cartilaginous substance has a great tendency, in the course of time, to undergo pathological changes. In the fibrous change, the substance acquires a yellowish, and in the granular change, it exhibits a whitish dull color. The intercellular substance is interspersed with numberless small, dark, sharply-defined molecules, and on the periphery of the cavities of the cartilage, with large gelatinous pulp of cartilage. The cricoid and thyroid cartilages first undergo the process of ossification, that is, the change of the hyaline cartilages into porous bone substance.

The epiglottis, the cartilages of Santorini, of Wrisberg, and the sesamoid cartilages, the processus vocalis, and the

points of the arytenoid cartilages, collicula, and proc-vocalis of the thyroid cartilage, consist of yellow or elastic cartilage, the basis substance of which is thickly interlaced with dark fibrillæ and large transparent capsular cartilage. This cartilaginous substance is not fully capable of ossification, but of incrustation.

The *lamina intermedia* of the thyroid cartilage consists of a hyaline cartilaginous mass, which is distinguished from the white laminæ by a more grayish color, and by smaller cartilaginous cells. Moreover, it exhibits a tendency to ossification, and in its shape it is broader beneath than above. (Rambaud and Halberstma). Upon the inner side of the lamina intermedia, and about in the middle of it, is found a small process, one of the elastic cartilaginous masses resembling fibrous cartilaginous tissue, with which the anterior extremity of the vocal cords stand in union. Luschka has proved that this tissue remains unchanged, even in ossification of the *lamina intermedia*. It therefore stands in an important functional relation to the tissue of the vocal cords.

These true vocal cords are duplicatures of the elastic membrane of the cartilages, and the sharpness on their edges, as well as their extraordinary power of vibration, is chiefly caused, according to Luschka, by the fact that their basis is an entirely independent cord, of dense, thickly woven, elastic fibres.

This ligamentous formation on its extremity stands in union with elastic cartilage, whereby the vibration is promoted, and the ossification diminished. The anterior extremity of the vocal cords stands also in such close connection with the previously described small cartilaginous process of the *lamina intermedia*, (the posterior extremity with the processes vocalis, consisting of elastic cartilaginous substance, and designated as *macula flava*,) that the fibrillary basis substance appears to be intimately blended with the interlaced elastic elements. A part of the fibrous tissue of the *musc-thyro-arytænoideus* is also so closely united with the elastic duplication, and as it were so interwoven with it, that thereby the most important part of the bodies of the vocal cords is formed.

In the epiglottis, which consists of elastic cartilage, are in-

terspersed perceptible, irregular furrows and gaps of cell substance, and of grape-like mucous glands. This glandular portion exhibits great tendency to ulceration, and, as a rule, is defined by a jagged boundary. The swelling of the epiglottis does not depend on a thicker cartilaginous substance alone, but more upon a cushion formed of fat and cells.

The perichondrium of the laryngeal cartilage forms a thick frame-work of cellular substance, with small, irregular, scattered elastic fibres. It contains quite a rich net-work of blood-vessels.

On the contrary, nerves are found only in small number, and as separate primitive tubes. (Luschka.) The epiglottis is the most abundantly provided with nerves.

MUCOUS MEMBRANE AND GLANDS OF THE LARYNX.

The cavity of the larynx is covered completely by a mucous membrane—the *mucosa laryngis*—descending, more or less firmly adherent, out of the cavity of the mouth and pharynx. This has not the same thickness in all parts, nor does it exhibit in all places the same grade of adherence. It is especially thin and firmly united on the free edge of the true vocal cords; thin, but less firmly adherent in the pouches of Morgagni. It is thicker and firmly adherent in the lower laryngeal space, on the inner surface of the vocal processes, and on the posterior side of the epiglottis. Upon the posterior wall of the larynx, and upon the lig:ary-epiglottidis the mucous membrane is especially spongy, and therefore particularly favors the existence of œdema glottidis, or more properly œdema laryngis. The capillary vessels of the mucous membrane of the larynx are much finer than upon other portions, and form coarser meshes than in the pharynx. Their color is not so intensely red, nor so uniform, as the mucous membrane of the cavity of the mouth and pharynx.

It appears much paler under the laryngoscope, and is supplied with ramifications of vessels often clearly discernible. The upper surface of the true vocal cords presents always a

pale white color. In women the color is of a brilliant white, like a tendon.

Upon the anterior and posterior extremities of the true vocal cords are observed four yellowish spots, *maculæ flavæ*, which, according to Gerhardt, proceed from the yellowish, elastic, cartilaginous substance with which the elastic tissue of each of the bands stands in direct connection. The two posterior *maculæ flavæ* correspond exactly to both vocal processes. Scarcely perceptible pores, of a roundish shape, proceeding from prominent glands and from the mouths of glands are found here and there, but most abundantly in the Ventr. Morgagni, on the posterior surface of the epiglottis, and the inferior part of the plica ary-epiglottica. While the mucous membrane of the cavity of the mouth and pharynx is covered with pavement epithelium, the laryngeal mucous membrane exhibits a ciliated covering consisting of elongated conical cells. The ciliated epithelium is interrupted by a narrow strip of pavement epithelium lying in layers which descend from the anterior wall of the pharynx through the posterior glottis, and cover even the free edge of the vocal cords in their entire length. The movement of the ciliated tissue extends into the trachea from beneath above, and, according to Biermer, is often perceptible even three days after death.

According to the investigation of Kölliker, there is no extensive loss of the ciliæ or of the ciliated epithelium of the larynx and the trachea.

Even in diseases of the organs of respiration, we find epithelium beneath the pus-like mucus, more or less intact, or uninjured.

The frame-work of the mucous membrane consists of two strata, superficial fibrillary connecting tissue, and in the deeper portion chiefly elastic fibres. On the vocal cords, the elastic fibrous layer is especially strong, since it is at the same time fastened to their elastic base.

The glands of the larynx vary between the size of poppy seed and that of a lentil, and are formed in clusters. They secrete a mucous fluid. They are especially numerous on the posterior wall, on the Ventricles Morgagni, on the entrance of

the larynx, and on the epiglottis, while in other parts they appear singly, and on the true vocal cords are wholly wanting.

There are considerable collections of glands within the plicæ ary-epiglottica, and upon the posterior surface of the epiglottis, in the space corresponding to the cushion of the epiglottis, surrounded with abundant fat.

The vessels of the larynx form with their capillaries a superficial net-work.

The very abundant lymphatic vessels extend to the deeper cervical glands.

Of the nerves, according to Bidder and Volkmann, the more sensitive laryngeus superior has the greater number of fine fibres, the motor laryngeus superior has the greater number of thick fibres.

Their terminations are found in the muscles, the perichondrium, and especially in the mucous membrane.

PHYSIOLOGICAL PHENOMENA OF THE FORMATION OF THE VOICE WITH REFERENCE TO THE ALTERATIONS DEPENDENT ON PATHOLOGICAL CHANGES.

The larynx belongs to the musical instruments which are designated as tongue-piped. There are wind instruments with hard and with soft tongues. To the former belong the well-known mouth-drum, to the latter, the larynx, with its double-lipped membranous tongues extended within its cavity, with its bellows (lungs), its air-tube (bronchial ramifications, trachea) and its mouth-piece (pharynx, mouth, and cavity of the nose). If the vocal cords are put in vibration by a continuous expiratory stream of air from beneath, while the glottis is contracted, a sound is made, the height and depth of which depends on the length, the elasticity and the extent of the tension.

The formation of the voice depends on four main points.

1. The air must be moved against the chink of the glottis with a certain expulsive power.

2. The chink of the glottis must not exceed a certain diameter. If the opening of the glottis extends more than one-

twelfth or one-tenth of an inch, no more sound will arise. But the opening is made chiefly by the glottis ligamentosa, while the glottis cartilaginea must remain closed to give rise to a pure sound.

3. The vocal cords must every time have a defined tension, for if they be very much extended, a shrieking, piping sound is made, whereas, if they be much slackened, only a dull sound is produced, if at the same time the glottis be much shortened.

4. The excursive capability of the vocal cords must not be interfered with, and their elastic power must be fully intact, as they are extended by the pressing forward column of air, and are thus dilated and elevated. The degree of tension depends on the power of the stream of air and the elasticity of the vocal cords. The free vibration of the vocal cords is possible in this way, because the ventriculus Morgagni is found above them, while at the same time the moistening, necessary for their function, is effected through the secretion of the glands contained in the mucous membrane of the larynx.

It may not appear entirely superfluous to quote briefly what is most noteworthy in regard to the modification and timbre of the vocal tone, inasmuch as singers not unfrequently desire an opinion in regard to their diseased organs of speech. I here give the deductions and views of one of our most approved singing teachers.

The breast tone characterizes itself essentially as a tongue tone, the falsetto and head tone as flute tones. In flutes the changing of the tone depends entirely on their length, and is only excited by the column of air. In the tongue-piped instruments, as we have already seen, the sound is caused by the vibration of metallic or membranous tongues.

It has been often disputed whether the primitive sounding part of tongue instruments be the tongue itself, or the air set into vibration. At any rate, the tongue has not a secondary part in the emission of sound, as the sounding power of a body depends on the character and continuity of the impulse through which it is put into vibration.

That the vocal cords, in spite of the fact that they are only short membranes, can, through their peculiar vibrations,

produce such a full, strong, and powerful sound, depends on the fact that the tissue of the vocal cords is so extraordinarily elastic. The tissue artificially formed out of cat-gut never attains such elasticity, much less can surpass it.

In the production of the breast tone, the function of the vocal cords can be compared with the blowing of trumpets. By proper muscular contraction, the inelastic lips may be changed into membranous tongues. If one puts a mouth-tube against such a lip put into sounding vibrations, the tone is not only more full, but, according to the quality of the mouth-tube, is modified in various ways. Thereby, the sound arises not only through the blowing in and out, but also through the co-operative oscillations of the lips. In this way the primitive sounding medium is not, as in flutes, the column of air vibrating in a mouth-tube, but the lips, acting as membranous tongues.

Furthermore, just as the tongue in flutes, and the lips in wind-instruments, so also in the production of the breast tone, the vocal cords must be considered as primary exciters of sound.

In the breast tones the vocal cords vibrate their whole breadth, and in large excursion. In the falsetto and head tones, whereby the chink of the glottis is more or less open, only the fine borders of the vocal cords vibrate; while the remaining portion remains dilated, and does not vibrate, and the glottis cartilaginea remains closed. Also in the falsetto tones, the vibrations of the vocal cords have a subordinate part in the production of sound. The air placed in perpendicular vibrations within the open chink of the glottis, is especially to be considered as the primitive sounding element.

In a normally formed tone, the glottis cartilaginea is entirely closed, and the expiratory air only passes through the glottis ligamentosa. Thereby is the whole column of air rushing out put into sounding vibrations, and a fresh and powerful tone is excited. If however, the glottis cartilaginea is not closed, the sounding column of air glides through the glottis ligamentosa. Yet this is not a sounding column of air, but, on its exit is mingled with the sounding air-waves, and being impaired in its energy and freshness, it gives a dull

and muffled sound. At the same time the consumption of air is greater and the respiration more frequent.

Upon the modification of the tone with reference to the character of the sounds, the pharynx necessarily has an influence, according as it is shortened, widened, or contracted.

We distinguish the principal types between which all variations are possible.

The clear quality appears when the pillars of the soft palate descend towards the up-heaving larynx. When this action is exaggerated, we have instead of a clear, piercing tone, a disagreeable, shrieking sound.

If, on the other hand, the larynx descends and the throat is thereby lengthened, the tone loses its clearness, but gains in roundness and volume, and takes the subdued timbre. This timbre when in great disproportion, makes the tone heavy and dull.

If we compare both registers, the breast-voice and the falsetto (the head register is only a higher modification of the falsetto, characterizing itself through an air-tone), we find that in the former the phonic glottis is closed up in a straight line in its entire breadth. The cords meet with a greater resistance in the expiratory stream of air, yet with full vibration, and the sounds are graduated through the expansion and compression of the lungs. In the falsetto, on the other hand, the phonic glottis has a lance-shaped, elliptical opening, during the vibrations, and the stream of air can exercise only a small pressure. The higher falsetto is produced through successive shortening of the opening of the glottis from behind.

The arches of the soft palate, the epiglottis, the ventricle and ventricular bands, are not directly concerned in the production of a breast or falsetto tone. They only modify the sound produced in the glottis. If we consider the various pathological changes of the parts of the larynx that will hereafter be discussed, it is easy to understand how even small affections may of necessity cause changes in the production of the voice.

Even when there is a light swelling and relaxation of the

vocal cords, they can no longer produce the full vibrations, with full expansion, that they can excite when in a healthy state. When such a process advances to prominent thickening of the vocal cords, accompanied, as is generally the case, with an increased mucous secretion, the voice must become correspondingly deeper, more veiled, muffled, and hoarse; and ultimately, there may be absolute aphonia. At the same time, an accompanying swelling of the ventricular bands may, by diminution—even by entire filling up of the ventricular space—assist in the various degrees of impairment of the vibrations of the vocal cords, and the production of sound, just as a valve acts upon a stringed instrument.

All these inflammatory symptoms of disease in their various shades are as completely accessible to the laryngeal mirror as greater pathological changes of tissue. But there are yet other disturbances in the mechanism of the vocal apparatus which do not record themselves in such manifest appearances of disease, but which are revealed in the laryngeal image only in an altered or impaired form of motion caused by a central or peripheric disturbed nerve action. These cause various changes in the production of the voice.

These symptoms will be spoken of in the chapter on Paralysis of the Glottis.

SECTION II.

DISEASES OF THE MUCOUS MEMBRANE, AND OF THE PARTIALLY AFFECTED SUB-MUCOUS TISSUE.

ALTHOUGH it is not possible in all cases to make entirely accurate distinctions between the chronic inflammatory processes of the tissue lining the larynx, we are, at all events, justified in regarding the view as false and bewildering, that treats chronic laryngitis as of equal importance with phthisis laryngealis. This is the case, however, in many text-books, and even in certain special treatises devoted to this subject.

The terminology is here in general much more arbitrarily adopted than in any other types of disease.

We find under the names laryngitis chronica, laryngitis mucosa chronica, laryngitis catarrhalis, laryngitis ulcerosa, laryngo-phthisis, and chronic hoarseness, one and the same state of disease described and presented in more or less clearly defined grades, even with the symptoms detailed with the greatest possible minuteness, and yet we get no clear image of the peculiar condition of the larynx.

This is a proof of the previous insufficiency of diagnostic aids.

A renowned writer mentions this in his excellent work on the diseases of the larynx, published before the introduction of the laryngeal mirror, and says: "If we can sometimes recognize, through clinical signs, the existence of deeper loss of substance in certain parts of the larynx, yet we find it in most cases very difficult, nay, often impossible to determine with certainty on the living subject, whether an existing chronic laryngo-tracheitic ulceration be already present or not, and, accordingly, in the uncertain distinctions between

chronic laryngitis-ulcerosa and laryngo-phthisis it is impossible to treat the latter separately from the former."

This opinion, pronounced hardly ten years ago, has been a long time refuted through the laryngoscopic method of examination, and yet even now the local diagnosis always receives far too little attention from recent authors of renown, and is accorded a much too subordinate importance in the ascertainment of nosology. The one treats of the subject of chronic laryngitis only under the name of simple ulceration of the mucous membrane, that is laryngeal phthisis, while others distinguish between chronic catarrh and the catarrhal tubercular ulcerations.

Others still distinguish only between *laryngitis chronica simplex*, and *laryngitis ulcerosa*, and include in the latter form *phthisis laryngealis*. It appears to me, that this last division is not sufficiently comprehensive, inasmuch as there are many cases where a *laryngitis ulcerosa* in no way depends upon a tubercular basis, still less exhibits a phthisical, that is, a consuming, destructive character. But rather they can be successfully treated, or at least without leaving behind essential alteration in the formation of the tones. I think, therefore, that it does not appear to be unimportant, but in a prognostic and therapeutic sense quite important, that in this department of chronic affections of the laryngeal mucous membrane, we should at least draw as strict boundaries between the various types of disease as we do in the affections of the rest of the air-passages.

Just as auscultation and percussion give us information in regard to the pathological changes in the lung tissue, just so, and with even greater certainty, are we to-day in a position to investigate with the greatest accuracy any form of laryngitis, and to obtain a clear and complete image in each individual case of disease.

I would place in the following groups all chronic inflammatory affections of laryngeal mucous membrane and the sub-mucous tissue contiguous to it.

1. Laryngitis chronica simplex or catarrh: laryngitis chronica.

2. Laryngitis chronica gravis or ulcerosa.

3. Laryngitis tuberculosa or phthisis laryngealis.

That we have to distinguish gradual differences in every one of these three forms, and that the transitions from one form to the other are sometimes, to a certain degree, blended together, is no ground why we should classify the above-mentioned types of disease together.

We should rather consider all gradations as transitions, just as in chronic inflammations of other organs.

Of subjective symptoms as they generally appear, we shall not speak in the customary detail, because from the diagnostic stand-point of the present day they have essentially lost their former importance.

The complaints of pressure, pain, pricking feeling, difficulty of swallowing, tickling, coughing, increased expectoration of mucus, rough voice, hoarseness, aphonia, dyspnœa, are symptoms which, in the various forms of laryngeal affections, are observed either separately or all together, without our being able to institute an accurate diagnosis or obtain a positive indication for treatment even in advanced stages of dyscrasic conditions, where often the general appearance of the patient gives already sufficient information upon the character of the disease.

The objective examination is necessary in order to enable us to give a decided opinion as to the more or less advanced pathological process.

LARYNGITIS CHRONICA SIMPLEX.

Anatomico-Pathological appearance.

Simple chronic laryngeal catarrh—simple chronic laryngitis—exhibits a more or less prominent hyperæmic stasis, relaxation, and swelling of the whole mucous membrane, with which, in cases of long-standing, a thickening, and even hypertrophy of the mucous and sub-mucous tissue can be associated. The cases advanced to a high grade also ex-

hibit very many swellings of mucous follicles, like grains of sand (follicular or granular laryngitis).

The mucous membrane has a dark-brownish appearance, as the result of displacement of pigment, which takes place after ecchymotic processes, and its surface is generally covered with a glassy mucus, but also with yellow mucous purulent secretion. In rare cases the epithelium is here and there deprived of its ciliæ and villi.

Sometimes the epiglottis is increased in diameter, and accordingly loses its power of motion, and becomes misshapen in appearance.

Ossifications of the cartilages of the larynx are observed only in very old cases, and are particularly to be distinguished from the so-called calcifications of the cartilages of the larynx, which only occur in advanced age.

Shallow, superficial, so-called catarrhal erosions, caused by deliquescence of the tissue of the mucous membrane, belong to the less frequent symptoms. They are especially observed on the glottis cartilaginea, the lig-ary epiglottidis and the posterior wall of the larynx. Their existence is to be accounted for partly through the mechanical effect of the continued friction, especially on the posterior wall of the larynx; partly by the fact that the tissue of the mucous membrane in the above named localities is rich and spongy, but deficient in elastic fibres.

The papillary growths that sometimes appear in long-standing cases of laryngitis, often exhibit on their surface a marked development of pavement epithelium.

The occurrence of the so-called catarrhal ulcers in simple chronic catarrh of the larynx, (laryngitis chronica simplex,) I must positively deny.

When such are observed, they are in all probability of a specific origin, generally of a syphilitic character, or the laryngitis is of a severe type, disposed to the formation of ulcers. Perhaps I here take issue with the views of those authors who treat of ulcers in general, with the exception of those which are described under simple laryngeal catarrh.

From a strictly pathological stand-point, they may be cor-

rect in considering follicular ulceration as only a higher grade of catarrhal erosion, a destruction of the very abundant mucous glands in the mucous membrane of the larynx. However, from the practical, therapeutical, and laryngoscopic stand-point, it appears to me to be more clear if we classify the true ulceration as a distinct, more advanced type of laryngitis, no matter if it merely exhibits a simple round destruction of tissue, or if it passes through the successive stages of ulcerous formations, and greater destruction, provided the appearance of the disease is essentially different from a simple chronic catarrh, when the more severe form readily comes to light, and demands very active and energetic treatment.

SYMPTOMS AND COURSE.

As has already been mentioned, the symptoms bear a very uncertain relation to the condition of the disease. Notwithstanding, we must strive to gain a clinical idea of the affection and to present the prominent symptoms in the several forms with the greatest possible precision, inasmuch as at least the one or the other symptom will find its elucidation, whether its importance be great or small, in the subsequent section, or on laryngoscopic diagnosis.

In simple laryngitis there is often perceptible only a painful, disagreeable feeling of pressure, and transient pricking sensations in the larynx. There may also be a tickling sensation as if from an ulcerated surface just as in acute laryngitis; there may be a burning pain even, and through loud, continuous speaking, through the inspiration of irritating gases and harsh air, it may grow essentially worse. The feeling of choking and suffocation are symptoms that frequently appear, especially in delicate nervous females. A deeper, muffled or hoarse voice is quite frequently observed in this form of inflammation, more rarely complete aphonia. But yet this is sometimes observed, especially if in prominent swelling of the ventricular bands and in advanced thickening of the true vocal cords, the latter cannot be placed in their necessary vibrations; and if, in addition to this, catarrh of the pharynx and trachea exist at

the same time, the power of producing sound is impaired by the relaxation of the mucous membrane.

In certain cases the change of the voice manifests itself only in the morning, to a very slight degree, but in the course of the day it becomes much more marked. The respiration is never disturbed in these cases unless neoplasms which narrow the cavity or a severe bronchitis exist at the same time. The feeling of roughness or tickling already mentioned, occasions repeated hemming and expectoration. There may be with it an habitual gentle cough, and sputa may even be expectorated, rolled up in little balls and tinged with blood. Afterwards, in the more advanced stages of this form of inflammation, there is more violent coughing, with spasmodic paroxysms, and this affection may be much increased by an intervening acute catarrh.

The general condition is usually undisturbed.

The course of the disease is often very irregular, unless local treatment is employed, and the evil tends rather to increase than decrease. So long as the patient is kept quiet the complaint recedes, while on some trifling cause all the symptoms become worse. In general, the evil condition becomes entirely corrected under proper treatment, after a shorter or longer time, without leaving behind any organic disturbance in the vocal apparatus.

[It should not be forgotten that mucous membranes that have for a long time been affected with inflammation are very prone to relapse after complete or partial recovery, provided considerance vigilance be not exercised. This is especially true of diseases of the respiratory passages, and of this fact patients should always be forewarned.

One of the greatest and most annoying difficulties experienced by laryngologists, is the recklessness with which patients expose themselves to night air, and to other injurious influences while taking a course of treatment for pharyngitis or laryngitis.

Amid the cold, dampness, and variations of our northern climate, it is often impossible to avoid these relapses, even though every hygienic law be sacredly observed.]

ETIOLOGY.

Laryngitis Chronica simplex is especially a disease of middle life. It is more common among men than among women, and is very rarely observed in childhood.

The most frequent causes of this form of disease are acute catarrhs neglected to a greater or less degree, repeated colds, especially of the feet and hands, injurious substances operating upon the larynx for a long period, such as remaining for a considerable time in an atmosphere filled with dust or other irritants, and especially continual speaking or crying. Therefore weavers, stone-cutters, millers, laborers in tobacco factories, engravers, singers and public speakers, are particularly liable to this affection.

However, other persons are often attacked by chronic laryngitis who are not exposed to the striking causes of injury in the manner mentioned above.

It is therefore not necessary to overlook the fact that a great number of laryngites have their origin in previous catarrhs of the throat and pharynx, and must be considered as an extension of disease through the continuity of the mucous membrane.

We find, therefore, that especially the residents of unfavorably situated, bleak and unhealthy sections, in spite of all their care and avoidance of the above-mentioned pernicious causes, are almost always afflicted with catarrh of the larynx and pharynx, particularly in the fall and winter.

Among the other injurious causes which operate unfavorably upon the throat and a portion of the laryngeal mucous membrane by direct contact, belongs the indulgence in locally irritating spices and drinks.

Therefore, laryngitis chronica is quite a constant symptom in gluttons and drunkards, and is readily distinguished in them by a peculiar kind of hoarseness (*raucedo potatorum*), and, as a rule, takes its origin by extension of the pharyngeal affection.

[Reasoning from theory and from experience, it would seem

that hot drinks might be a prominent cause of pharyngitis, and in direct consequence, of laryngitis.

The contact of almost scalding liquids—tea, coffee and the like—repeated two or three times daily, can but have a relaxing and weakening effect on the mucous membrane and render it less able to resist the variations of temperature. The same may be said of very hot solid ingesta, of any kind whatever. There must certainly be some universal and persistent cause or variety of causes that prevents the great majority of our adults in America from having a normal pharynx or larynx. Those whose laryngeal or pharyngeal mucous membrane presents the normal color—that of a boiled salmon—are the exceptions. Many go all their lives hemming and expectorating, without even suspecting that their respiratory tract is in any manner diseased.]

The opinion promulgated by Stokes and adopted by some authors, that a chronic swelling and elongation of the uvula is the mechanical cause of the extension of the inflammatory process, by continually irritating the base of the tongue, I can hardly believe. The elongated uvula is rather to be considered as a product of the *angina faucium* than as a cause of laryngitis. This is proved by the fact that in spite of excision of the uvula not the least improvement takes place in the laryngitis. We perform this operation then, as a rule, only to free patients from the irritating sensation of tickling caused by long-continued touching of the uvula against the roots of the tongue. Sometimes local blood-letting connected with this operation contributes to a diminution of the *angina faucium*.

Finally, we have to remark that new formations in the laryngeal space, in the majority of cases, give rise to *chronic laryngitis*.

LARYNGOSCOPIC DIAGNOSIS.

The auscultation and percussion of the larynx, we can very properly dismiss as a diagnostic aid, since the method of examination with the laryngoscope renders possible a very strict diagnosis, even in the most difficult cases.

We see in the simple chronic laryngitis, as compared with the acute, a deeper red, sometimes dirty, bluish red, or brownish color, and velvety relaxation of the whole or of certain parts of the mucous membrane of the laryngeal space.

The mucous membrane is much swollen, thickened, and in many cases uneven, through increase in volume of the mucous follicles. The sub-mucous tissue is also not unfrequently affected, and it likewise becomes swollen and hypertrophied. In some cases papillary growths and mucous polypi are observed shooting forth on the posterior wall of the pharynx, or underneath the ventricular bands.

The thickening of the sub-mucous tissue of the mucous membrane is often of such a high degree that the ventricles of Morgagni disappear from sight, and the vocal cords appear to be fully closed in phonations, so that only a small border is left in view. The ventricular bands also lie closely together, and the ary-epiglottic folds appear like closed nymphæ. The posterior wall of the pharynx also is disposed to become hypertrophied, so that even in the deepest inspiration, as well as in their widest separation, the arytenoid cartilages can form a semi-lunar convexity. In regard to the special color of the vocal cords, this varies between the lightest rose-red and the deepest dark-red; also, often, a single vocal cord exhibits a prominent isolated redness and swelling; and the same thing is true of the ventricular bands; sometimes there is observed instead of the normal yellowish white base, only certain straight or meandering vascular injections, or ecchymotic spots. In many cases, only the border of the vocal cords, the points of reflection into the ventricles of Morgagni, the region of the vocal cords lying on both sides of the angle of union, or the posterior portion that is found on the glottis cartilaginea, are observed to be reddened.

The hypertrophy of the vocal cords is especially marked by thickening and unevenness of the projecting borders. At the same time there is not unfrequently a marked disturbance in the movement of the arytenoid cartilages, and a relaxation of the vocal cords in phonation. The mucous membrane of the epiglottis uniformly participates more or less in

the inflammatory symptoms. Most frequently, the posterior surface is greatly reddened, while the anterior surface, especially in old persons, presents a very distinct venous network.

Variations in the form of the epiglottis are not unfrequent symptoms, after long-standing inflammations of the larynx. There are also cases in which, with prominent inflammation of the ventricular bands, the *lig: ary-epiglottica*, the arytenoid cartilages, together with the posterior wall of the larynx, the vocal cords yet remain wholly free, and of a white color. This symptom obtains more especially in the female sex.

The secretion is in many cases unimportant, and resembles a fine foam, but generally it is sticky and shreddy. It adheres readily and firmly into the deepest portions.

In phonation it sticks between the vocal cords in the form of clumps, and may cause a rattling tone.

If the trachea participates in the inflammation, there can be seen, in a deeper inspiration, a lively redness of its mucous membrane, to which here and there clots of mucus adhere.

The catarrhal erosions appear of a roundish, and of an oblong, striated form, with quite a shallow and fresh-appearing base. Only rarely are there observed widely gaping, irregular, eroded portions of the tissue of the mucous membrane. Whether the laryngitis be simple, syphilitic, or whether it arises from some other source, can neither be determined with positiveness by means of the laryngoscope, nor by the symptomatic etiology. The examination of the patient will soon enable us to ascertain the true cause, and an anti-syphilitic treatment will furnish the test of a constitutional disease.

PROGNOSIS.

This may in general be regarded as favorable. But if the difficulty is an old one, and recurring injurious causes continue to affect it, its course may be very protracted.

If certain parts become prominently hypertrophied, especially if anatomical changes occur, which depend upon a

thickening of the submucous tissue, a complete recession of this process is not to be expected.

To this class belong all those cases of hypertrophy of one or the other ventricular band, (both bands are rarely affected to a high degree at the same time,) when, as a result of a cold, or of straining the voice, and the acute swelling of the mucous membrane thereby excited, the already diminished clearness of the voice may advance to complete hoarseness.

Alarming symptoms will arise only with acute, hyperæmic, extended growth of the mucous membrane, or other new formations.

This process, however, does not strictly belong to laryngitis, but to the class of new growths, under which head, we shall detail what is necessary in regard to their cause and treatment.

THERAPEUTICS.

Before we enter upon the special therapeutics, let us remark briefly in regard to the prophylaxis.

As much as I approve of the practice of hardening the throat by washings with cold water, I am yet decidedly opposed to the favorite method of exposing the throat to influence of cold air. The mucous membrane of different individuals varies very much in its capability of resisting variations in temperature, and the majority of people are readily disposed to pharyngeal catarrh, the existence of which is not usually observed before it has extended itself to the larynx. It is therefore always well for irritable individuals to regulate themselves with special care, according to the variations in the temperature, keeping the whole body warm, especially the throat, the breast and the feet.

But in the great variety of means employed against laryngitis—systems of treatment, and water-cures—it is necessary to carefully winnow the over-abundant material. If one considers the enormous number of highly-lauded methods of cure, and the fact that patients often test the whole round of these without obtaining any definite and complete result, we see that it is time for us to estimate the individual elements of this

mighty curative apparatus according to their true merits, to eliminate the traditional and the superfluous, but especially to place in the foreground the importance of a complete system of local therapeutics under the guidance of the laryngoscope.

We will, then, speak first of the general dietetic management, next of the special medication, and finally of the direct local treatment.

GENERAL DIETETIC MANAGEMENT.

In the milder and not very old forms of chronic laryngitis, rest of the organs, with other appropriate hygienic management, will be followed by good results.

The protection of the organ of speech must be regarded as a condition *sine qua non*, especially in the female sex. It forms an important adjuvant with every general as well as local treatment. The larynx, with its inner structures, is so delicate and movable an organ, that all mechanical influences are at once more sensitively felt by it when it is once affected with disease, than by any other part of the human body.

Therefore, the patient should avoid all loud speaking and singing, and all talking in the open air in cold weather, especially while walking. Very irritable, sensitive individuals may use a respirator with advantage, and may wear a flannel jacket, or any tight-fitting *close* jacket next to the skin, especially if they are inclined to perspire easily. Laborers who are exposed for a length of time to a pernicious atmosphere filled with dust or irritating chemicals, must select an occupation that allows them to live in healthy rooms, where the air is not too dry, but rather is somewhat moist.

The diet of weak persons should be very nourishing and blood-enriching, and they should wholly abstain from all spicy and acid foods that irritate the mucous membrane, but especially from all spirituous drinks, strong beer, and other heating liquids that cause congestions.

Therefore staying for an unreasonable length of time in restaurants where beer-drinking is going on, and where the thick tobacco-fumes darken the air, is to be forbidden most decidedly.

The continual inhalation of the smoke of tobacco is without doubt far more injurious and irritating to many than the act of smoking itself. I therefore allow a moderate amount of smoking, provided other symptoms do not imperatively forbid, to those who are unquestionably affected with a mild form of laryngitis, inasmuch as I have not observed therefrom any marked disturbances either of a subjective or objective character. As appropriate drinks, I usually recommend milk, cocoa, soda water alone or with milk, red wine and sugar water.

Among the so-called hygienic domestic remedies, the drinking of warm water in the morning, and the eating of the roe of herring, sometimes afford a little relief; but we can no more expect a complete cure from these than we can from the hydropathic packings of the throat, so much praised by the laity and even by physicians. They may temporarily diminish the subjective symptoms, but can never accomplish a complete cure, as may be shown by a daily inspection of the parts.

[In this country and in England, the so-called "*dysphonia clericorum*," "clergymen's sore throat," has attracted considerable attention, and was at one time quite fashionable.

There is in this disease nothing that is peculiar, nothing that is distinct from the inflammations of the same parts in laymen.

It is probable, however, that clergymen are more frequently the victims of the various grades of inflammation of the larynx, than any other class of professional men.

The causes of this discrepancy are quite obvious :

1. Clergymen do most of their speaking on the Sabbath, oftentimes under great pressure, and little or none during the week. The vocal organs are therefore *periodically overworked*.

Our successful and busy advocates speak more than clergymen, but their labor is more evenly distributed from day to day.

2. Most of our clergymen affect the "pulpit tone," which is to the last degree unnatural, and is as harmful to the vocal organs as it is to the cause they advocate. Lawyers usually

speak in a more natural conversational tone, and are not as closely confined to their notes.

3. Until recently, clergymen have felt it to be their duty to remove the covering that God designed for the throat—the beard, and to substitute the white cravat of many folds.

This sinful custom, is, however, passing away, and with it, in a certain measure, the disease that it invited.

To these three special causes, then, we must look for an explanation of the prevalency of “*dysphonia clericorum*,” and not to other general harassments of their calling, for it is abundantly established by statistics that clergymen are the longest-lived of any class except farmers.]

MEDICAL TREATMENT.

In considering the subject of special medical treatment, we should, in every instance, first ascertain whether a pharyngitis be associated with the laryngitis. As a matter of fact, in the great majority of cases, we have first to direct our attention, either before the removal of the disorder or at the same time with it, to that which usually excites and maintains the laryngeal affection. Upon the exclusively local method of treatment we will speak hereafter. But we may as well remark at once, that the so-called gargles, viz., *infus. sage*, *sol. alumii*, *argent nit.*, etc.—which are to this day ordered in a most incomprehensible manner, even in laryngeal affections—do not at all come in contact with the walls of the throat. In the act of gargling, the pillars of the soft palate together with the uvula lie closely together, and form a complete partition between the cavity of the mouth and the larynx. Therefore, any remedy employed in this way, can only be efficacious in special affections of the tonsils, pillars, and uvula.

Upon the uselessness of a decapitation of a somewhat inflamed and elongated uvula, towards the curing of laryngitis, we have already spoken in the section on Etiology.

The operation can only be of advantage when it precedes other methods of treatment: inasmuch as the diseased conditions of the throat are kept up by an elongated uvula,

and thereby the cure of the laryngitis is interfered with and delayed.

Local blood-lettings carefully repeated, are warmly recommended by some clinical teachers; but with this method of treatment I cannot unconditionally agree.

I have not been able to obtain the least results from them except in very rare cases, and then only, as a general thing, in very full-blooded persons, disposed to congestions. Local blood-lettings, even with careful indulgence of the organs of speech, only give satisfactory results for the complete cure of laryngitis in those isolated cases, more especially, which are accompanied with a prominent swelling of the sub-mucous tissue. The local treatment with drugs forms the chief agent, and the local blood-letting must at best be only an adjuvant.

Among the derivatives, friction with *croton oil* has obtained a certain reputation. I confess that I have secured only meagre results from this application. I prefer the employment of vesicants on both sides of the larynx, or the use of caustic potash, and the consequent purulent discharge kept up for weeks, as being far more radical and effective.

Of internal remedies we possess none which have any specific effect on the mucous membrane of the larynx.

Plummer's powder is forgotten. Opium, belladonna, hyoscyamus, ammonia, senega, sassafras root, tartarized antimony, are to be valued only as means for the relief of symptoms; and are to be employed when the object is to alleviate the co-existing cough, or to remove the asthmatic symptoms, through expectoration.

A laryngitis which proves to be syphilitic, must in the first place be treated through a general anti-syphilitic system of medication, and, to this, local treatment must be added simultaneously or subsequently.

This leads us to the direct local treatment of the larynx, which acts most surely, in the majority of cases, even when all other methods give more or less unsatisfactory results. In very old and obstinate cases, local medication alone is capable of removing the evil; and even by this method the applications must be kept up for a month.

And yet not only old cases, but laryngites of a recent date, frequently defy all agents and systems of water-cure hitherto mentioned, if the local treatment be not resorted to at the same time or subsequently. I consider, therefore, the local blood-letting, the derivatives, and the use of mineral waters, at least in the great majority of cases, as mere adjuvants, and should never treat a chronic laryngitis with these means alone. I feel myself the more justified in this assertion, because quite a number of cases of laryngitis of various types have come under my treatment after having in vain resorted to all other systems of practice, including the homœopathic and hydro-pathic.

For our satisfaction, also, other recent authors and clinical teachers, who do not specially occupy themselves with the laryngoscopic observations of the larynx, accord to local treatment a great importance, and recommend it, even though it be employed in the unsatisfactory manner formerly advocated by Trousseau. Since the introduction and perfection of laryngoscopy, the art of making local application of remedies has increased in importance. Although it is not my purpose in this connection to set forth the method of procedure in local treatment, I will yet briefly remark upon the one point to which we should give particular heed if we would have the remedies take effect in the proper place.

The so-called *touching*—the introducing of a sponge saturated with medicated or medicinal substances, into the larynx—is no easy operation. On the other hand it demands great practice and a dexterity not possessed by all in a like degree. Through a skilful touching, the introduction of medicated substances, which is always disagreeable to the patient, can be much lightened, while the awkward application of the sponge causes vomiting and choking, just as is the case where the laryngoscope is clumsily introduced by an unpractised hand.

The merit of first recommending local treatment in the diseases of the mucous membrane of the larynx, and of establishing thereby a more certain basis for the treatment of

laryngeal affections, belongs to Charles Bell, Trousseau, and Belloc.

Want of diagnostic aids, however, was the chief reason why the above method was used only to a limited extent, and had even almost passed into forgetfulness. This method was adopted, however, by English and American physicians, *e. g.* Scott, Watson and Green, but yet without obtaining any great applause.

It was first reserved for Czermak, who deserves such high praise for perfecting and popularizing the laryngoscope, to secure a complete and positive basis for the local therapeutics of the diseases of the larynx, and with the assistance of the laryngeal mirror, to show in the most satisfactory manner the uncertainties of the system of healing announced by the above-mentioned writers.

The art of Bell, Trousseau and Belloc consisted in pressing down the tongue with a spatula, and in introducing a curved whalebone, with a sponge fastened to its extremity and saturated with a medicated solution (usually a concentrated solution of nitrate of silver) over the laryngeal aperture towards the œsophagus. They expected then, that in the course of the consequent choking movements, the larynx would rise up and the sponge would be pressed into its entrance.

With the introduction of the laryngoscope, we very soon find out the necessity of the greatest possible elevation of the epiglottis, by a forcible outstretching of the tongue, in order to secure a passage for the introduction of the instrument, that shall be entirely unobstructed.

From this fact, it follows that firm wire is preferable to the flexible whalebone, since it can direct the sponge into the larynx with greater certainty. A whalebone very readily adapts itself to the œsophagus, and operates more like a throat sound, than as a laryngeal instrument. But, although the superiority of the wire over the whalebone is so manifest, this obsolete instrument is still recommended by an author of recent date, and finds its way into the text-book of another. Some physicians exclusively use a camel's-hair pencil, strongly fastened to a wire, for touching the larynx. If it be designed

merely to touch a special, definite spot in the throat, or in the larynx itself, I admit that the pencil is of value, but above all, I must decidedly prefer and recommend the use of the sponge. A pencil holds much too little fluid, and the touching must in all cases be frequently repeated, to say nothing of the disagreeable sensation caused by the repeated contact of the pencil with the throat, and the danger that some hairs may become loosened, adhere there for a long time, and give rise to painful irritation. In the use of the sponge, all the walls of the throat are touched mildly and to the same extent, and one application suffices to introduce more fluid than six applications of the pencil. But without regard to this fact, it seems as though the mechanical effect of touching the relaxed and sensitive mucous membrane with the sponge were of positive advantage. In no other way can I explain the good results which I have obtained by touching with quite indifferent substances, when, although the mucous membrane of the larynx was otherwise healthy, yet, its extremely great irritability to variations of the temperature has caused the severest paroxysms of coughing, and sensitive nervous pains in the larynx.

I cannot warmly enough recommend the use of the sponge, as I have described it, together with the whole technical manipulation in my *Lehrbuch*, previously referred to.

It is, however, necessary for the physician to acquire a certain grade of dexterity in the introduction of the instrument.

For those rare cases in which the epiglottis lies far back, and where, on account of this unnatural position, the introduction of the instrument appears to be difficult, we may use only a small syringe, somewhat like Anel's, which I have also described and designed in my *Lehrbuch*.

Trousseau and Belloc used a similar syringe at that time, because the long-continued introduction of the sponge without stretching out the tongue was an extremely disagreeable procedure for the patient.

The touching or injecting is performed daily, or only every other day, and we should not be terrified if sometimes at the first applications, trifling choking sensations are experienced, or even paroxysms of coughing.

The burning sensation in the throat which is felt in the first application, soon disappears, and diminishes in intensity with each application. We should, therefore, not regard the groundless complaints that are made against this method of treatment.

In regard to the choice of remedies in making local applications, the *nitrate of silver* takes the first place. We should not be over-anxious in regard to the dose, and should prefer as the weakest solution, $\mathfrak{D}$ i. to $\mathfrak{Z}$ i. of water. But this should be boldly increased to $\mathfrak{Z}$ ii, and even yet higher, to $\mathfrak{Z}$ i.

Next to the nitrate of silver, *tannic acid* deserves to be recommended.

This can be employed in yet stronger doses. *Sulphate of zinc* and *acetate of lead*, especially in union with each other, are also properly regarded as valuable in those rare cases where there is marked sensitiveness of the mucous membrane. *Alum*, *bi-chloride of mercury*, *sulphate of copper*, etc., are decidedly inferior in efficacy to the above-mentioned remedies.

The system of treatment first introduced by Bretonneau, and which consisted in allowing the patients to breathe in finely pulverized medicaments, (nitrate of silver gr. ii. mingled with $\mathfrak{Z}$ ii. of sugar,) by means of a tube 8 inches long, one end of which was laid over the tongue, has been justly forgotten since a more rational method has been introduced. Acetate of lead, alum, sulphate of zinc, sulphate of copper, and nitrate of bismuth have also been inhaled in this way. However, this procedure has been reduced to a complete art by Czermak, by blowing the powder, under the guidance of the laryngeal mirror, over the epiglottis by means of a curved glass tube, (still more conveniently with a silver tube,) which is provided with an elastic bag for pressure. The whole mass of powder will then surely reach the laryngeal space, while by the old method the greater part remains adherent to the wall of the pharynx. In the method proposed by Czermak, it is necessary to exercise caution at the moment of phonation, in order that the particles of dust may not be driven into the windpipe through the some-

what opened vocal cords, and thus excite the irritation of coughing.

Czermak has also used this tube for the introduction of fluid remedies.

Of the inhalation of remedies in an elastic fluid form (gas, steam, smoke), which are so much extolled in laryngitis—namely, narcotic vapors of hemlock or stramonium, simple steams of hot water, smoke of stramonium, or opiated cigars; inhalations of tar, turpentine, iodine, bromine, vapor of sulphuretted water, etc.—I think that they ought to be forgotten, or, at most, should only be employed when an intercurring painful affection, or other co-existing disease is to be treated at the same time.

At any rate, the effect of these inhalations will be only palliative.

[The prominence given by Dr. Tobold to nitrate of silver in the treatment of inflammations of the larynx, will probably surprise those who have not given the subject particular attention, and whose ideas of the therapeutics of laryngeal affections are derived from common, or even from professional prejudice.

The dislike that patients entertain towards this remedy is so great that they will often discontinue the treatment if they even suspect that it is employed, and some refuse to be treated at all, except on the express condition that nitrate of silver shall not be used. Many suppose that the throat is more sensitive after it has been touched with caustic solutions. This impression probably arises from the fact that the mucous membrane that has ever been chronically inflamed, is liable to relapse, whatever may have been the method of treatment employed, and as nitrate of silver is most generally used, and is to most a disagreeable remedy, it is not strange that it should have to bear the blame of the subsequent carelessness or misfortunes of the patient.

I have tried to dispense with it, by substituting solutions of iodine, tannin, alum, sulphate of zinc, but all of these combined, and in their greatest strength, are vastly inferior to nitrate of silver.

As a general thing, too weak solutions are used, and there-

by the treatment is unnecessarily protracted. Strong solutions—say 3 ii. or 3 v. to the 3 i.—are far more efficacious, and but little more disagreeable than the weaker and more cautious doses.

Among the substitutes for nitrate of silver that I have found of great service, are the mingled fumes of muriate of ammonia and tincture of iodine. The method of employing these is described in the introduction.

Internally, I have tried aconite, belladonna, bromide of potassium, and chlorate of potassa.

Of course all internal medication in severe chronic laryngitis, is to be used only as an adjuvant to the local applications.

Those patients who are weakly and nervous should be built up by all practicable tonic influences. One of the very best of these is *general electrization*.]

In conclusion I have to speak of a method of treatment that has recently come into vogue, the inhalation of finely atomized fluids, that has been so assiduously proclaimed by industrious charlatans. And, first of all, I must express my doubts whether this new problematical procedure will ever obtain the general introduction into practice that its sanguine advocates hope for.

If now in almost every bathing place inhalation halls are being erected, because the curative method hitherto employed is not considered entirely satisfactory, it shows either that there is strong faith in the healing power of the waters or great mistrust in them. If we take even the water that is most efficacious for internal use, namely, sulphur water, I should query of what service this could be when atomised and brought to bear directly on the mucous membrane in the form of spray, if the effect of solutions of tannin, alum, and nitrate of silver, used in this way, is scarcely perceptible.

I hold that the inhalations even of the above-mentioned remedies in laryngitis chronica are entirely superfluous, and, at all events, much too slow in their operation. As long as we are able to bring remedies to bear upon the laryngeal cavity in another way, and by more rapidly efficacious solutions, that is by means of the sponge and syringe, we can dispense entirely

with this very uncertain and inefficient procedure. According to my observation and experience, the curative power of inhalations is limited chiefly to that portion of the respiratory passages that lies below the vocal cords. I would therefore employ the system of inhalation only in certain affections of the trachea and bronchii, of which I shall speak hereafter under the therapeutics of laryngitis tuberculosa.

CHRONIC ULCERATIVE LARYNGITIS.

Anatomico-Pathological Appearance.

The mucous membrane exhibits quite a considerable relaxation, together with a prominent swelling and thickening of the strata of sub-mucous tissue. The ulceration characterizes itself, according as the ulcers attack the mucous membrane or the follicles, by a very dissimilar pathological process, and by very diverse objective appearances. Catarrhal ulcerations arise through breaking down of the inflamed mucous membrane. They begin with quite shallow erosions, usually remain isolated, and are not specially inclined to penetrate into the deeper tissues.

Follicular ulcerations, on the contrary, begin with softening over a swelled and injected follicle, and after this is destroyed by a purulent consumption, a deeper ulcer, usually isolated, sometimes in the form of a crater, remains, bordered by swollen or other relaxed mucous membrane. After it heals up, it exhibits a scarcely perceptible, somewhat lustrous, but not radiant, appearance, when the surrounding mucous membrane grows over from the border on to the newly-formed, thick cellular tissue.

Both forms of ulceration extend themselves, to a greater or less degree, particularly upon the ary-epiglottica ligaments, the ventricular bands, and the wall of the epiglottis. The vocal cords themselves are rarely attacked on their upper surface, inasmuch as this is deficient in glands, but rather on their anterior and posterior extremities, likewise on their inferior surface, which have a grape-like structure, and are disposed to follicular ulceration. Marked destruction of tissue, however, will never

result from catarrhal, nor yet from follicular, ulcerative processes.

Of the aphthous, variolous, and tythous ulcerations of the larynx, inasmuch as they are the processes that take place in acute forms of inflammation, it does not come within my province to speak.

SYMPTOMS AND COURSE.

The symptoms here manifest themselves in the same way as in *simple chronic laryngitis*, but are usually of a much higher grade. Palpation, pressure, and lateral displacement of the framework of the larynx are very sensitively felt by the patient. Coughing and speaking, after a time, excite a severe and painful sensation, so that the patient purposely whispers inaudibly. The breathing causes a peculiar, resonant, deep, rough tone. There is great difficulty of swallowing, especially if an active pharyngeal catarrh or ulceration of the œsophagus exists at the same time. If the epiglottis be attacked, there will be regurgitation of fluids through the nose. The expectoration is muco-purulent, and not unfrequently mingled with bloody ingredients.

The alterations in the voice are at first very diverse and inconstant. As a rule, they are increased by variations in the temperature, by long-continued speaking, coughing, and by irritating drinks. In far advanced stages, prominent swelling of the vocal cords and hypertrophic thickening of the ventricular bands give a roughly-sounding tone to the voice or cause complete aphonia. Irritating cough is not always present; it may be very trifling, even when the disease is quite severe. So soon, however, as an acute catarrh supervenes, the attacks of coughing become spasmodic in their character and reach a high degree of intensity.

The general condition is usually undisturbed, while in other cases the strength is reduced and there is great depression of the spirits.

The course of this disease is more protracted than that of simple laryngitis.

The ulcerations heal slowly, and there ensues a gradual diminution of the symptoms of inflammation or swelling of the mucous membrane and sub-mucous tissue.

ETIOLOGY.

Laryngitis ulcerosa as an idiopathic disease, owes its existence in general to the noxious causes already mentioned under the preceding form of disease. Moreover, a follicular catarrh or a simple chronic laryngitis, if neglected and allowed to exist for a long time, disposes to ulcerative laryngitis, especially if the patients, at the same time, have to undergo excessive straining of the vocal apparatus amid frequent changes of the temperature. Under these circumstances, an existing erosion of a trifling character readily assumes the form of a more or less encroaching ulcer, especially if the simple laryngitis has already reached the stage of follicular swelling. The perpetual contact and the friction of the swelled walls form the chief mechanical irritating cause, and thereby the numerous mucous glands which lie upon the posterior wall of the larynx, the cushion of the epiglottis, the lig: ary-epiglottica and especially the chink of the vocal processes afford a very good field in which an ulcerative process may arise.

It is also necessary for us not to overlook the fact that individuals who are merely disposed to tuberculosis, or who, at some previous time, have been affected with syphilis, are liable to be attacked with chronic laryngitis with formation of ulcers, while the laryngoscope gives not the remotest indication of any specific character in the disease, nor does the mild course of the morbid process admit of any such explanation.

LARYNGOSCOPIC DIAGNOSIS.

In laryngitis-ulcerosa there appears as a constant laryngoscopic appearance, first of all, a more or less decided relaxation and inflammatory swelling of the mucous membrane and of the sub-mucous tissue, together with infiltration of the glands. Moreover, in the beginning there can be easily discerned either small eroded ulcerated surfaces, or isolated deeper

ulcers. The first have smooth bases, and are quite superficial. Sometimes they are confluent, and only with very careful observation can be recognized their distinct borders. These appear surrounded by a more or less inflamed areola, or are covered with quite small papillary growths.

These are found most frequently upon the processes of the swelled, inflamed and slackened vocal cords.

In the follicular ulceration we observe a deep funnel-shaped ulcer which either appears isolated, or, as is not seldom the case, forms small irregular deeper and more superficial ulcerations that run into each other. These appear usually upon the vocal cords themselves, especially upon the process of the vocal cords, then upon the posterior wall of the larynx, the ventricular bands, the anterior surface of the arytenoid cartilages and the cushion of the epiglottis. When the ventricular bands are much swollen, so that the vocal cords, especially in inspiration, quite recede from view, and only show a swelled, dirty and eroded border, it is necessary, during the inspection, to repeatedly make strong phonations. The vocal cords will then stand out a little, at least, and we can then obtain a distinct image of the condition of their surfaces and of the ulcers that exist there. Sometimes papillary, quite pointed neoplasms sprout out from the base of the swelled posterior wall of the larynx. The epiglottis generally assumes a shape more or less altered, sometimes is even quite deformed.

PROGNOSIS.

The prognosis here is not quite so good as in simple laryngitis. Hypertrophy and induration of the sub-mucous tissue are not unfrequent consequences, and very generally leave behind a marked disturbance in the vocal apparatus. Ulceration, with resulting perichondritis prepare the way for a sudden and dangerous attack of cedema of the glottis.

In cases which have a mild course, however, the larynx may fully regain its normal anatomical condition and its physiological function.

THERAPEUTICS.

For these forms of disease, the remedies and methods of local treatment recommended in simple laryngitis are of value. The treatment must be much more energetic, and sometimes demands a long time before the morbid process is arrested and the formation of the voice becomes normal. Ulcerations on the vocal processes demand a particularly careful attention and a prompt local treatment, inasmuch as there may readily occur a loss of substance on these parts, and thereby the voice may be irrevocably destroyed.

In ulcerations on the epiglottis, we use with advantage, for making applications under the guidance of the laryngeal mirror, a small hair-pencil fastened to a silver wire. When it is necessary to touch certain spots with pure nitrate of silver, I use a caustic-holder on which nitrate of silver is melted.

INFLAMMATIONS AND ULCERATIVE PROCESSES IN CERTAIN PARTS OF THE LARYNX.

Not unfrequently, even quite isolated inflammations and ulcerations attack especially certain parts of the larynx. Therefore, these affections will find their appropriate place in connection with the two principal forms of laryngitis. With reference to the symptomatology, course, and etiology of these, we refer in general to what has been said upon laryngitis.

EPIGLOTTIS.

The chronic inflammation of the mucous membrane of the epiglottis is characterized by a deep-red, sometimes livid color that renders it conspicuous above the other parts of the larynx. The posterior wall of the epiglottis is usually more affected than the anterior, because the mucous membrane, on the posterior surface, is separated by the cushion of the epiglottis, which is composed of a thick layer of fat and cellular tissue, and thus has a greater disposition to inflammation, while the

same, on the anterior side, rests only in thin layers, and directly upon the cartilage. The anterior wall exhibits irregular, prominent, reddish, sometimes deep-blue reddish, ramifications of vessels; the posterior, on the contrary, presents a uniform, deep-red, velvety color and swelling. If the epiglottis is originally furrowed, or trough-shaped, curved, and at the same time held firmly back, the laryngoscopic inspection can be rendered quite difficult through the existing inflammatory process. The retraction of the epiglottis is frequently at first the result of a shrinking up of the tissue of the ary-epiglottic ligaments, when these are attacked by the deeply penetrating inflammatory process or infiltration.

Erosions and ulcerations on the epiglottis, without regard to those which are of a specific or secondary return, are not so very frequent.

The disease prefers the border of the epiglottis, and next to this its cushion, and the portions that extend down to the angle of the glottis.

Sometimes I have observed a considerable loss of substance of borders of the epiglottis, dependent on an aphthous process. In regard to the deposits on the epiglottis, resulting from chronic exudation, I will speak in the chapter on neoplasms.

We have here yet to mention a process that rarely occurs—abscesses of the cushion of the epiglottis—that is, simple primary abscesses—inasmuch as those collections of purulent matter that depend on perichondritis, will be spoken of later, or under these forms of disease.

The simple primary abscess of the cushion of the epiglottis is the product of an inflammation of the sub-mucous cellular tissue, thickly set with racemose glands, and of the mucous membrane of the larynx itself. The surrounding tissues are found, under laryngoscopic examination, to be more or less affected with œdematous swelling, and with advancing maturity the yellow color of the contents glistens through the distended mucous membrane. Severe cases may cause a very harassing feeling that may increase to a difficulty of breathing. As the symptoms are just the same as in general œdema

of the larynx, only the laryngeal mirror can give a positive diagnosis.

As soon as an emetic proves useless, we must not delay opening the abscesses with a curved concealed knife.

ARY-EPIGLOTTIC LIGAMENTS OR FOLDS.

On account of the great mobility of these parts, the sub-mucous covering and mucous membrane is not unfrequently exposed to chronic inflammations and ulcerative conditions.

The redness here is not as prominent as in inflammation of the epiglottis.

But the consecutive thickening of the folds can reach a certain grade, and thereby may result disturbance in the mobility of the epiglottis, a tendency to fall backward, and subjectively, great difficulty in swallowing and in speaking, such as occurs in advanced forms of laryngeal tuberculosis.

The primary ulcerations that occur here present nothing abnormal. They heal with topical treatment, usually quite rapidly, without leaving marked traces behind.

VENTRICULAR BANDS.

The morbid affections of the ventricular bands form an important agent in the changes of the voice. They can increase considerably in volume through inflammatory swelling, sometimes concealing the vocal cords to the median line and entirely filling the Morgagnian space. They form, as it were, a valve for the vibrating vocal cord, and upon the character and grade of their affection wholly depends the possibility of exciting a tone. Sometimes there is not only a disturbance of vibration of the vocal cords resulting from the swelled ventricular bands, but there arises also a vicarious vibration of the bands, with moderate projection of the vocal cords. The alteration in the voice which is thereby caused, is recognized by a deep, hoarse, rough, stammering tone. In the laryngoscopic examination, the vocal cords are observed to project, with a narrow margin, only at the instant of a

gentle, or very strong inspiration, while later in phonation they are fully concealed, and both ventricular bands lying against each other show a wide vibration. Not seldom the result of such a long-standing and neglected inflammatory swelling is a permanent hypertrophy of one or both of the ventricular bands.

The local treatment with nitrate of silver in solution or in substance is wholly powerless against this kind of change of tissues.

There remains the diminution of the volume, with formation of cicatrices, and for this the galvano-caustic is especially to be recommended.

VOCAL CORDS.

Healthy vocal cords are of whitish, tendon-like color. Women have generally bright white, mother-of-pearl vocal cords, while those of men are of a dingy white. This leading type, however, undergoes many changes; there are also men whose vocal cords at all times are redder than is natural, and yet we are not able properly to consider such as diseased. Nor do such individuals manifest any alteration of the voice or any subjective symptoms. This variation from the normal condition, is, however, the result of an inflammatory process which has run its course, and many return to a healthy state spontaneously, or through local treatment.

The most frequent affection of the vocal cords is the chronic inflammation of the mucous tissue, with or without the sub-mucous tissue being attacked. As in the different kinds of laryngitis, so also here this inflammation is observed quite isolated, in the various shades, from the lightest hyperemia to a deep red color.

A frequent morbid product is the alterations of the vocal cords (designated as *dermoid metamorphosis* by Förster), which generally occurs after a long chronic inflammation, and extends itself upon the half or the whole course of the vocal cords. The mucous membrane of the vocal cords, which, in a normal condition, is without papillæ, usually contains papil-

lary tissue ; while the epithelium suffers a considerable thickening.

The vocal cords metamorphosed in such a way, have generally a hard, uneven, yellowish-white appearance, and are evidently more or less restricted in their vibrations.

An affection of the opposite character is atrophy of the vocal cords.

This is not peculiar to advanced age, but is found also in young persons, and must be considered as a local disturbance of nutrition. The cord appears then strikingly small, lax, and is as thin as paper. Both processes—hypertrophy as well as atrophy—being organic diseases, manifestly do not admit of any therapeutical procedures.

A strikingly isolated affection of the vocal cords is capillary apoplexy, the bloody infiltration of the mucous membrane. Up to the present time, I have found this advanced form of inflammation only upon a single vocal cord. The epithelium appears, as it were, injected, of a blood-red color, resembling somewhat the conjunctiva of the eye-ball suffused with blood, after the operation for strabismus. Several times have I seen, upon the border of a vocal cord that has been considerably thickened in this way, a prominent, crater-form, tapering ulcer, which contributed more to the alteration of the voice than the inflammation itself. The small ulcer on its border especially shows the beginning of a vegetative growth. The touching with nitrate of silver in substance is the most sure method of cure. In one of those cases, a deep-red, vascular injection yielded, in the beginning of the treatment, to a paler color, and the patients were able to give a clear tone. With the coming on of menstruation, suddenly appeared an entirely new infiltration, like an acute apoplexy, and the patient was again just as hoarse as in the beginning of the examination. A similar yet more advanced case relapsed in the course of the treatment, and the patient, who was in the first half of pregnancy, was attacked with vomiting. The examination showed a renewed deep-red, vascular injection on the whole surface of the vocal cords. Continued treatment removed the evil in a short time, as in all cases that have

come under my observation. The vocal cord resumed its normal shape and color, and the voice remained permanently undisturbed.

Yet another type of disease is the granular inflammation of one or both vocal cords. This inflammation may be distinctly limited, in a very noticeable manner, to a single vocal cord. It depends not alone upon an overloading of the capillaries of the fibrous tissue that forms the mucous membrane, but at the same time is a hypertrophy of the sub-mucous tissue beneath. It is hardly worthy of mention, that the voice in such cases is essentially altered. The treatment here demands an energetic application of concentrated solutions of nitrate of silver.

Finally, we frequently observe, especially in very anæmic females, a circumscribed redness and swelling of the anterior and posterior portions of the vocal cord. In the latter case, the hard processus vocalis already mentioned, by the continual friction and irritation of the swelled mucous membrane, can very easily give rise to the ulcerous formations already described in *Laryngitis Ulcerosa*.

POSTERIOR WALL OF THE LARYNX.

The posterior wall of the larynx is poor in elastic fibres. On the other hand, the *plica ary-epiglottica*, the cushion of the epiglottis, and the upper wall of the ventricle of Morgagni, are most abundantly provided with grape-like glands.

When we consider this fact, and the movements and irritations to which this part of the larynx is continually subject, it is very clear that, just in this place, inflammations, swellings, and ulcerations will most frequently occur. Swellings of a moderate size may produce a marked derangement in the juxtaposition of the vocal processes, and thereby destroy the clearness of the voice. After long-continued inflammation, and continuous irritation, the swelling sometimes reaches so high a grade on the parts of the mucous membrane lying between the insertions of the vocal cords, that, in phonation,

a very perceptible fold is wedged in between the vocal processes, causing more or less hoarseness.

The histological relations already mentioned, and the necessarily recurring mechanical act of folding and stretching of the posterior wall of the larynx afford a very productive field in which erosions and ulcerations may arise and extend. (See tubercular ulcerations, under the chapter on laryngitis tuberculosa.)

. Neoplasms are rarely found on the posterior wall of the larynx. I have observed only three of them. In two cases, syphilis had preceded; so that I may be inclined to regard such as condylomata. This will be spoken of farther on, in the chapter on neoplasms.

ARYTENOID CARTILAGES.

The inflammation, swelling, and thickening of the arytenoid cartilages alone, or in conjunction with the posterior wall of the larynx, is one of the most frequent types of disease that comes under our observation. The healing does not take place as rapidly as in affections of other parts, unless—in consideration of the great mobility of this part—particular care be exercised, on the side of the patient, to avoid external injurious causes, and disturbing irritations, such as screaming, long-continued speaking, etc. The sub-mucous tissue takes more or less prominent part in the inflammatory affections, and causes the arytenoid cartilage to become more roundish, velvety, and reddish. It appears that the upper border of the posterior laryngeal space, lying between the arytenoid cartilages, when swelled in such a way, becomes in a manner flattened and indistinct. Primary ulcerations on the arytenoid cartilages are less frequently observed. Generally, they are the results of a perichondritis dependent on syphilis or tuberculosis.

The therapeutics of the diseases of portions of the larynx above described are, in general, about the same as have already been mentioned in connection with the different forms of laryngitis. In inflammations, the use of the sponge is

called for. In ulcerations, the use of the camel's-hair brush, saturated with concentrated solutions of nitrate of silver, or the caustic-holder is indicated.

ANÆMIA OF THE MUCOUS MEMBRANE OF THE LARYNX.

One symptom, opposite in its character to the forms of inflammation previously described, is the isolated appearance of anæmia on the laryngeal mucous membrane of individuals whose general condition is undisturbed, and who are not particularly anæmic. We observe this especially in women and girls; and yet men are not wholly free from it. Various subjective symptoms of the larynx may result from anæmia, as I have certainly observed in the absence of other general or local diseases.

Among these symptoms especially to be mentioned are, great sensitiveness towards the changes of the weather, long-continued pain in the larynx, and nervous paroxysms of coughing.

Whether the abundant nerve-fibres that extend in the mucous membranes of the larynx are altered in their function, especially through local poverty of blood, or through general deficiency of the blood-formation, I will not positively decide.

However, according to my observations, the administration of preparations of iron, together with the use of baths containing preparations of iron, has resulted, though after a long course of treatment, in a perceptible and complete removal of the subjective symptoms, and restoration of the normal color, as demonstrated by laryngoscopic examination.

These brief hints may suffice to call the attention of other physicians also to further observations of the local affections here spoken of.

SECTION III.

SECONDARY FORMS OF INFLAMMATION AND ULCERATIVE PROCESSES.—PROMINENT AFFECTION OF THE SUB-MUCOUS TISSUE.

Laryngitis Tuberculosa or Phthisis Laryngealis.—*Anatomico-Pathological Appearance.*

Laryngitis tuberculosa is chiefly distinguished from the two preceding groups by the presence, either of a tubercular infiltration of the mucous membrane (the tissue of which gradually becomes relaxed and necrosed, and degenerates into ulcerative formations that extend more or less in depth and breadth) or through the existence and extensive softening of miliary tubercles. Both forms occur either separately or together.

Miliary tuberculosis, which is rarely observed, exhibits small, gray miliary tubercles, scattered about in the swelled mucous membrane, and these, later on, become yellow, soften, and in their disintegration form small ulcers of the size of a millet grain or of the shape of a lentil. Still later, these extend yet deeper into the sub-mucous tissue as well as upon the surface. Sometimes they even extend considerably in circumference, by running into each other, forming new deposits of miliary nodules, and give rise in this way to necrosis of the cartilage of the throat. The ulcers that arise through aggregation, present, not very roundish, but irregular, shaggy, infiltrated, tooth-like borders. The tubercular process chiefly extends itself on the inner part of the larynx, and in all cases proceeds from thence upon the trachea.

The posterior wall of the larynx, the *processus vocalis* of the vocal cords, their anterior commissure, and the epiglottis are most frequently attacked. The latter can under-

go quite a considerable infiltration and deeply penetrating loss of substance.

In regard to the occurrence of ulcerations on the arytenoid cartilages, Rheiner has shown that they originate in a very different way from the tuberculous ulcers that are observed on other parts of the larynx. It forms in the first place an ulcerous spot on the inner surfaces of the arytenoid cartilages lying opposite each other, from which it extends into the pocket-like cavity, the base of which it deprives of its perichondrium and leaves the cartilage wholly or partially necrosed. The latter can sometimes be fully detached and expectorated, whereby the vocal cords lose their point of fixation, and their function is entirely destroyed.

It is more common, however, for the tuberculous inflammation of the mucous membrane to penetrate from the upper surface into the deeper tissues, and then a perichondritis of the arytenoid cartilage arises, which results in the formation of abscesses and causes a secondary perforation.

The ligaments of the larynx resist the destructive process the longest, until after being a long time covered with tuberculous pus, they fall off in necrosed shreds. In rare cases the tuberculous process, after destruction and perforation of the cartilage, extends upon the surrounding parts, and after perforation of the skin, it forms a tuberculous fistula, or breaks through posteriorly into the œsophagus.

SYMPTOMS AND COURSE.

Laryngitis tuberculosa in its earlier, and even in its more advanced stages, is not characterised by symptoms sufficiently marked to distinguish it from *laryngitis ulcerosa*, which is an affection less dangerous to life, unless a tuberculous affection of the lungs can be ascertained, through auscultation and percussion, or an existing interior participation of the whole organism corroborates the diagnosis. On the contrary, the subjective symptoms, even in the advanced stages, are so trifling in comparison with the severity of the disease, that the physician has difficulty in being convinced of the serious character of the

affection after a preliminary physical exploration of the larynx of the patient. Just as in tuberculosis of the lungs, the local process can remain latent for a long time, and be indicated only by a rough or aphonic voice.

In other cases, the symptoms progress from the outset in the most intense and rapid manner. The irritability of the mucous membrane is oftentimes so great that the patients, without the least cause, will be attacked with the most severe paroxysms of coughing, that can hardly be overcome, and even an advanced pulmonary tuberculosis, with symptoms otherwise prominent, may be thrust completely into the background.

The assertion of some authors that a very distinctly pronounced aphonia indicates the existence of an ulcer on the vocal cords, is entirely untenable. Oftentimes, even where the vocal cords are entirely ulcerated, the voice may yet be passable and audible, though not fully sonorous, while even quite a moderate infiltration of the ventricular bands, or, such as cause them to come in contact with each other, may so weaken the vibrations of, and lift up the true vocal cords (though they are not affected with ulceration) that complete aphonia may exist.

Single or double paralysis of the muscles of the glottis dependent on some ulterior morbid process may also exist and give rise to a nervous aphonia.

In general, the local affection steadily advances with the extension of the tuberculosis of the lungs, and there are usually deceptive remissions, of longer or shorter duration, in which cases, also, the affection of the lungs is concealed.

It is a matter of frequent observation that the laryngeal tuberculosis retrogrades to a noticeable extent, with symptoms of swelling, and that even small discolored borders of the vocal cords make their appearance. The voice also is in a measure restored, until after a sudden very violent attack of hæmoptysis, the old trouble of the larynx again appears, much worse than before.

In advanced stages, and especially after tuberculosis of the lungs has supervened, there are symptoms of hectic fever. With general ulceration, the larynx also becomes distinct

through its prominence and contour on the wasted neck. Pressure and pain in the vicinity of the larynx are the usual complaints of the patients. Even the simple act of swallowing is painfully felt in the throat and the ears, and when the attempt is made with quite hard, or even fluid substances, they are eagerly received into the larynx, but are expelled from the mouth and nose, with choking and severe coughing.

These symptoms indicate with considerable certainty infiltration or ulcerative process of the arytenoid cartilage, or of the epiglottis. The cough, which is painful, and even gives rise to vomiting, has a high, barking tone. The expectoration consists of frothy, muco-purulent sputa, that imparts an offensive odor to the breath. Sometimes a part of the framework of the laryngeal cartilage that has become necrosed, is expectorated. When the expectoration is difficult, it indicates more particularly a co-existing tuberculosis of the lungs, since the viscid masses of mucus that are continually forming in the bronchia adhere very obstinately, and ultimately find a new obstacle to their exit at the narrow aperture in the larynx. The respiration also is at the same time much oppressed, difficult, and noisy, nay even, through co-existing increased swelling and thickening of the sub-mucous tissue, the calibre of the glottis itself is narrowed.

With the progress of the hectic fever, even orthopneic attacks occur, until death results with the symptoms of suffocation.

ETIOLOGY.

Tuberculosis laryngitis is developed only as the effect of general constitutional tuberculosis, and in the majority of cases does not appear prominent until the advanced stages of tuberculosis, because, as we have already seen, the mucous membrane and sub-mucous tissue are first attacked with tuberculous infiltration.

My own observations are decidedly opposed to the statements of Trousseau and Belloc in regard to the spontaneous occurrence of phthisis laryngealis. *I hold that tuberculosis of the larynx is exclusively a product of tuberculosis of the lungs.*

Some of the recent writers who prefer not to dismiss the view adopted by Trousseau and of Andral, but would rather find an explanation there, think that the laryngitis tuberculosa in an objective yet not demonstrable stage of tubercular deposit may enter into the lungs, or that the affection of the lungs, possibly, may result from a laryngitis simplex, and that it in later stages takes on the tuberculous character. To advance speculations and conjectures of that sort, without giving special regard to the local appearance, seems to me to be entirely useless.

With distinctive tubercular deposit in the lungs there may be a laryngitis without, and with, the formation of ulcers, without the latter being proved to be tuberculous. Under such circumstances, a fully established laryngitis may be cured without leaving any disturbing symptoms. If we should claim that every laryngitis that exists in conjunction with an evident chronic affection of the lungs were therefore tuberculous, even though it were ulcerous in its character, and ran a protracted course, we should fall into the old and indistinct idea of laryngitis which was obtained without the aid of local diagnosis.

The true state of things, as we shall see in the chapter on diagnosis, is, rather, that the peculiar tuberculous infiltrations, which have first been exactly examined by means of the laryngoscope, give a certain decision as to the actual appearance of laryngeal phthisis.

That the breaking up of the cavernous secretion favors the formation of laryngeal tuberculosis, according to the view of Louis is opposed by the very numerous cases where an affection of the larynx has already far advanced before cavities have been formed in the lungs. Just as little could tuberculous bronchial sputa through contact with yet healthy laryngeal mucous membrane excite analogous processes, unless ulceration of any other kind already existing in the larynx, favors the absorption of tuberculous matter.

However, we have no positive knowledge in regard to these cases.

According to the deduction of Rheiner, it is possible that

the vagus nerve, supplying the lungs and the larynx, may be the agent for the transmission of the pernicious disease.

LARYNGOSCOPIC DIAGNOSIS.

The laryngeal images presented in laryngeal tuberculosis differ in very many ways, according as the tuberculosis is of an infiltrated or miliary character, or of both forms existing together, and also according to the greater or less extension which the local morbid process has already reached. These may, therefore, be arranged into three groups, corresponding to the various stages of the destruction.

This destruction diffuses itself in the following way: First, the mucous membrane is attacked with or without ulcerous formations; then, the sub-mucous tissue, with the imbedded glands, participates; and finally, the perichondrium and even the cartilage take part in the disease.

Frequently, the image of a chronic catarrh precedes the declared symptoms of laryngeal tuberculosis. We have then a more certain ground for suspecting tuberculosis, when we find developed more or less light gray infiltrations of the mucous membrane, and when, besides, traces of erosions or ulcerations appear on the insertion of the *processus vocalis*, the inflamed and swollen arytenoid cartilages, or upon the adjacent parts of the vocal cords.

Great irritability of the mucous membrane, connected with anæmia of the larynx and trachea, if it occurs in weak, slender individuals, may excite apprehensions of the ultimate development of tuberculosis.

First stage.—The mucous membrane is pale, or in many cases affected with catarrh. On the posterior wall of the larynx, the ventricular bands and the ary-epiglottic folds, besides inflammatory swelling and relaxation of the tissue, we observe small prominences of infiltrated glands, that are of a dull gray, sometimes of a green color, (light tuberculous infiltration.) The posterior wall of the larynx is relaxed and swelled. The true vocal cords may be intact as far as their reddened eroded origins, or they may present a yellow,

glassy condition, under increase of volume, and with redness already extended over the Morgagnian ventricles. If it be possible, on deep inspiration, to get a view of the walls of the larynx and trachea, beyond the vocal cords, the mucous membrane exhibits an intensely inflamed, reddened, and relaxed appearance, while at the same time, here and there, tenacious masses of mucus adhere.

Not seldom we observe from the outset merely an isolated, but quite marked inflammatory swelling (infiltration), of one or both of the arytenoid cartilages, when the exploration of the chest fully confirms the suspicion of secondary affection of the larynx.

In many cases we see even in this stage the whole superior cavity of the larynx occupied with the so-called tubercular growths of the mucous membrane.

These are of a very pale color and of a cauliflower appearance. They usually have their origin in the Morgagnian ventricles, on the processus vocales, and on the posterior wall of the larynx, and have extended themselves from there to the ventricular bands, even upon the ary-epiglottic folds.

In rare cases this stage, besides the general appearance of a mild laryngitis, exhibits *ulcers* on the thickened processus vocales, that are quite isolated and prominent, round or oval, with swelled borders and filled with viscid secretion.

In the *second stage* irregular ulcers running into each other appear from the base already infiltrated, on the portions that have numerous follicles, upon the cushion of the epiglottis, upon the posterior wall of the larynx, and upon the tips of the vocal processes. The borders of the thickened vocal cords appear eroded or gnawed into shallow ulcers, while in many cases, granular condylomata of the size of a pin's head, adhere here and there between them. At the same time, one or other of the arytenoid cartilages, or both, soon appear to be thickened, very much inflamed, or are affected with œdematous infiltration. Upon the superior surface, they are covered with quite shallow ulcers, that present a grayish-white secretion, and the mobility of the vocal cords is considerably interfered with. Sometimes we observe only

one vocal cord considerably thickened, while the other remains for a long time intact. The border, which is otherwise sharp, becomes changed into a dirty-gray surface, upon which are seen many ulcerated spots and depressions, covered here and there with purulent secretion. At the beginning of this stage, also appears a total infiltration of the epiglottis, whereby its mobility is reduced to a minimum. The rough, sometimes quite aphonic voice, depends less upon the thickening and consequent deficient vibration of the vocal cords, than upon the considerable swelling of the ventricular bands, which act as a sort of a muffler for the vocal cords.

In the *last stage*, the infiltration increases to such an extent that the epiglottis, as it appears in the mirror, attains a diameter of from three to four lines. The border of the same may be intact, or with a more or less prominent, irregular loss of substance, may be covered over with a dirty exudation. Sometimes only a deformed, thick stump remains visible.

Irregular, jagged ulcers extending into the deep portions, frequently of a diphtheritic character, and covered with papillary growths, especially on the posterior wall of the larynx, extend themselves around and above, within the cavity of the larynx. They secrete a greenish-yellow pus mingled with thready and frothy sputa. Partly on this account and partly on account of the prominent infiltration of the ventricular bands, the vocal cords are entirely removed from observation, and in their place pale red swellings project. A marked destruction does not affect the vocal cords in proportion to the other portions of the larynx. They resist much longer the consuming process, and if they are not accessible to observation it is on account of the extensive infiltration of the ventricular bands.

Post-mortem examination confirms this in a striking manner. A rare case in point, that fell under my observation on post-mortem, showed the lig: ary-epiglottica entirely consumed, the left ventricular band destroyed in its whole extent, covered with excrescences, and the right in a condition of considerable infiltration, while the vocal cords presented a thickening, but no loss of substance.

With syphilis it is very different. Here the disease has a

predilection for the vocal cords, and cases that have healed not unfrequently exhibit floating rudiments of former vocal cords. Where the arytenoid cartilages are destroyed through perichondritis and necrosis, hardly any movement is perceptible in inspiration and phonation. The softened and swelled tissue of the mucous membrane is characterized, especially in the last stages, not so much by a red as by a dirty gray appearance.

PROGNOSIS.

In the great majority of cases the prognosis is unfavorable. Death usually ensues, with the accompanying symptoms of tuberculosis of the lungs. However, there are cases, although only very few, where a complete cure is observed.

I know of two cases in which there was not only a temporary stand-still, but a complete cure and recession of the local morbid process took place. Both patients living here in Berlin, presented themselves to me, with the symptoms of advanced tuberculosis of the lungs, and of disease of the larynx as I have described it under the second stage of laryngeal tuberculosis.

Severe fever, dyspnoea, considerable emaciation, complete aphonia, hoarse cough and so forth, were the mournful symptoms which compelled me to abstain from a local treatment, to make a very indifferent prognosis, and to prepare the parents to abandon all hope of an amelioration of the condition. In both cases a surprising healing process set in, as was ascertained both by auscultation of the chest and by inspection of the larynx. The full clearness of the voice and the increase of the fulness of the body were pleasing evidences that a curative process was going on. As would naturally be supposed, a certain difficulty of respiration is experienced in vigorous movements of the body, and in ascending stairs, when the parenchyma of the lungs is partially destroyed. That, moreover, the widely-projecting vocal cords present gnawed portions on their borders, is very natural, considering the grade of the previous morbid process.

THERAPEUTICS.

There is generally so little that can be accomplished for the cure of a disease that depends on a constitutional tubercular basis, that we are compelled to differ from certain authors who recommend local blood-letting, followed by emetics in the exacerbations.

Such procedures must of necessity diminish the bodily vigor, and operate injuriously on the already relaxed and irritable mucous membrane. On the contrary, just as in tuberculosis of the lungs, we must strive to secure the best possible nutrition, and it is necessary to throw off every irritable condition of the throat, in this more than in any other affection of the larynx.

The attention must be primarily directed to general tonic treatment with strengthening dietetic regimen. We allow the use of bitters, cod-liver oil, barley meal, milk, oysters, strong meat diet, etc., and we conduct the internal medication on the same principles as in the disease which lies at the foundation of it—tuberculosis of the lungs. Against the harassing symptoms of cough, and difficult expectoration, opium, belladonna, hyosciamus, continue to be the necessary remedies. Local derivatives on the throat appear to be of service in many cases, especially in the incipient stages. Attacks of suffocation, excited by œdema of the glottis, in many cases will call for tracheotomy.

In regard to the residence of patients affected with laryngeal phthisis, I recommend places of mild, moist climate, which are fully protected from rough winds, and such as we have spoken of as useful in laryngitis chronica.

[The air of sugar refineries has been popularly supposed to have a beneficial effect on the diseased mucous membrane of the respiratory passages. From the results of cases where a persevering trial of this been made, it would seem that this impression were well-founded. In a foot-note appended to this passage, Dr. Tobold earnestly recommended a long residence in sugar-houses for patients affected with laryngeal phthisis.]

In this disease, especially, the most scrupulous indulgence of the vocal organs, nay, even long-continued silence, must be enjoined on the patients, and although the local application of remedies cannot be regarded as having any specific value, yet it should be understood that in conjunction with general treatment, the *touching* of the larynx and the pencilling of the prominent swellings and spongy excrescences of the mucous membrane that occur in tuberculosis of the larynx, has an unmistakably beneficial influence on the local condition. Especially in those cases where the tuberculosis of the lungs is brought to a stand-still, the local application of solutions of tannin, or of nitrate of silver, will exercise a decided influence on the infiltrations and ulcerations of the larynx.

Without regard to this, however, the local applications have a tonic and cleansing effect on the tissue of the larynx, which is disposed in a marked degree to relaxation and the formation of secretion.

The patients always find that the local treatment is somewhat beneficial and ardently desire it, and they often place greater hopes on it than can be ultimately fulfilled.

According to my experience, the touching of the strongly infiltrated mucous membrane with nitrate of silver solutions, has a far too irritating effect, especially upon the arytenoid cartilage and epiglottis. Under these dyscrasic conditions the swelling of the irritable tissue of the larynx seems to increase, rather than decrease. In every case, I have seen more soothing and favorable results from the application of solutions of tannin, and would, by all means, give it the preference in the treatment of tuberculosis of the larynx.

Of late, inhalations have been recommended for laryngitis tuberculosa. These, however, are based more on recommendation than on scientific principles.

We will readily concede that the inhalations of atomized fluids can be so far palliative as indeed to cause a moderate dilution of the viscid secretion, and to favor the expectoration, and we will not deny that this procedure has a psychical advantage, since it inspires the disheartened patient with new hope. But precisely here is the efficacy of inhalations limited,

and if we are expected to believe that advanced phthisis of the larynx and of the lungs is healed in this way, (as has been claimed in some compends with an assumption of scientific enthusiasm,) we must in the interest of truth enter our decided protest against such a delusion.

Just as readily would we believe that the syphilitic poison could be cured by the inhalation of the vapor of water.

LARYNGITIS SYPHILITICA, SIMPLEX ET ULCEROSA.

Anatomico-pathological appearance.—Syphilitic catarrh of the larynx—the simple syphilitic laryngitis—is in no way distinguished in its pathological character from simple catarrhal laryngitis. The same is true of simple secondary ulcer of the larynx, which occurs somewhat more rarely, and cannot be positively distinguished as specific from other forms of ulceration, either in its locality nor yet through its form and appearance. Only the tertiary ulcerations present characteristic diagnostic signs. Such ulcers usually begin on the borders of the epiglottis, especially on its extremity, readily force their way deeper into the tissue, and show great tendency to consume the surrounding parts, inasmuch as they extend from them upon other portions of the larynx in the sub-mucous tissue, and cause considerable destruction of tissue, just as when they occur in the perichondrium (perichondritis syphilitica.) They have beside a jagged form, borders that are much swollen, of a deep-red color, and a base covered with dirty yellow specks. Frequently the parts surrounding the ulcers are covered with polypoid growths just as in parts that have become cicatrized.

As the ulcers heal, fibrous, radiating cicatrices are formed, and give rise to serious deformities, even to narrowing of the calibre of the larynx.

The neoplasms that occur in syphilis belong to the class of condyloma. They present partly a whitish, dull, warty thickening of the epithelium, partly pointed, raven-beaked, reddish projections. The latter grow exclusively on the posterior wall of the larynx, the latter upon the vocal cords, ventricular bands and ary-epiglottic folds.

SYMPTOMS AND COURSE.

All the subjective symptoms that obtain in simple idiopathic laryngitis—namely, painful feeling of pressure, tickling, fugitive pricking sensations, hoarseness, are also peculiar to the forms of inflammation that depend on syphilis. Only when they occur after a previously existing syphilitic affection (primary syphilitic ulcer), or where there is an obstinate persistence of the symptoms, that increase in severity in spite of energetic local treatment, should there be a suspicion of a specific nature.

These symptoms will not permanently disappear until after mercurial treatment for the syphilitic character of such form of inflammation has been adopted.

A co-existing attack of condylomata and syphilitic ulcerations, I have never observed. In this second stage, simple secondary ulcers may occur in the larynx quite isolated, and may cause quite important destructions, especially on the vocal cords, without the mucous membrane of the throat being affected, either before or at the same time.

But usually ulcerative processes exist previously on the mucous membrane of the throat which may even cause considerable destruction of tissue on the uvula and pillars of the palate.

Finally, when patients have repeatedly suffered from syphilitic affections for a number of years and have made greater or less use of the whole round of sweating and inunction treatment, but at the same time have been free from every local affection, the subtle poison may yet break forth in the shape of *tertiary* ulceration of the larynx without any demonstrable cause, or after catching a very severe cold. With the symptoms of harassing pain in the throat, of rough aphonic voice, or of increased secretion of unhealthy mucus, tinged with blood, a material destruction of tissue in the larynx may often result in a short time. The characteristic symptoms that forebode the commencement of narrowing of the larynx, very soon make themselves perceptible in this process, until an œdema of the glottis, *increasing* destruction

of tissue, and contraction of cicatrices forcing their way to the perichondrium, and also the formation of growths on the mucous membrane contiguous to the ulcerations, give rise to suspicious paroxysms of ulceration. In these cases only tracheotomy can avail to save the life of the unfortunate patient.

The fearful localization of the poison in one of the noblest organs of the human body, I have only observed when the uvula and pillars present, at least to a greater or less degree, the traces of the characteristic deformities and contractions of cicatrices. But generally these parts, together with the wall of the pharynx, have already reached the third stage, and allow the destructive ulcerative processes to extend upon the larynx in the manner above described. Amid the progress of the declared symptoms—a feeling of annoying dryness in the throat, marked difficulty of swallowing, increased secretion of unhealthy mucus, not unfrequently mingled with bloody constituents, severe pain in the ear, &c.—we find that the ulcerations force their way to the periosteum and even to the vertebral column.

As a rule, also, the greater portion of the septum, and also of the soft palate, are attacked, and even the hard palate is perforated. When death does not terminate the horrors of the unfortunate patient before this pharyngeal and laryngeal destruction is completed, even exfoliated splinters of the bones of the vertebral column, or necrosed fragments of the cartilage constituting the frame-work of the larynx, may be expectorated, amid nameless agonies.

ETIOLOGY.

The larynx is involved very frequently in the course of syphilitic disease. Men and women are equally liable to syphilis of the larynx. It is stated by certain authors that men are more frequently afflicted by this disease than women. This is to be accounted for by the fact that the male sex are more liable to the syphilitic poison, and must be correspondingly more liable to laryngeal syphilis. A quite harmless catarrhal laryngitis, dependent on the usual exciting causes, is,

in the majority of cases, the cause of the localization of syphilis in the larynx. In this way we explain the fact that tuberculosis of the larynx is not unfrequently combined with laryngeal syphilis.

In most cases, the affection of the throat precedes the syphilitic affection of the larynx, and it can appear in the form of ulcerations, exudation, inflammation, croupy deposits, swelling or hypertrophy.

LARYNGOSCOPIC DIAGNOSIS.

Syphilitic catarrh of the larynx, exhibits no appearance that is peculiarly different from general laryngitis. The entire mucous membrane of the larynx appears hyperæmic, deeply reddened, relaxed and swelled. Even a bluish-red appearance, a kind of line of demarcation between diseased and healthy portions, as well as a turbid, aphthous-like covering over the mucous membrane, are no positive, absolute diagnostic distinctions. The syphilitic ulcer arising through excoriation or molecular destruction of a circumscribed infiltrated portion of the mucous membrane, cannot ordinarily be distinguished by characteristic signs. In this first stage, the diagnosis can only be established by the history of the case, or by other coincident symptoms of the syphilitic taint.

In the first place, condylomata of the mucous membrane and tertiary ulcerations, even without any regard to the history of the case, indicate the character of the affection with positive certainty under a laryngoscopic examination. The condylomata are of two varieties—those which are of a flat shape, and those that appear as acuminate projecting neoplasms.

Later, they appear as grayish-white, small, flat, warty prominences, especially on the posterior portion of the vocal cords, the ventricular bands, and posterior wall of the pharynx, more rarely on the ary-epiglottic folds. Later still, they form red, smooth, firm appearing, roundish, raven-beak-shaped prominences, the apices of which are thickened on their extremities.

This form of condylomatous growth I have thus far ob-

served only on the posterior wall of the larynx, directly over the vocal process. In phonation they lie over the glottis, and very naturally impair the clearness of the voice.

The tertiary ulcerations are of an uneven, jagged, and sharply defined form, and have elevated deep-red borders; or, if this is removed through contact with the walls of the larynx, a dirty-red, smooth base. The surrounding sub-mucous tissue is in a stage of protuberant, inflammatory swelling.

Upon the epiglottis these ulcers extend with a redder surface, and very sharply contoured borders, that rise like walls, while not far therefrom a fibrous formation of cicatrices causes quite a considerable deformity. In many cases, also, instead of the epiglottis only a cicatrized rudiment appears. In many places the ulcerated spots appear entirely contracted through radiating formations of cicatrices, and are covered with abundant papillary growths, while the ulcerative process extends on other places.

In advanced cases deformities arise in the course of the contraction of cicatrices of such a character that we find a complete narrowing of the larynx, without any movement of the rudimentary elements. As a general thing, the vocal cords or their rudiments degenerate into œdematous swellings that overlap their angles of union. In inspiration these lie against each other, like valves, and in phonation and in loose vibration allow white masses of mucus of the size of grains of corn to project forth.

When the ulcerative process has reached its termination, and when, with entire disappearance of the poison only the vocal cords are destroyed, these appear conspicuous during phonation as floating whitish shreds, while in calm respiration they are not discernible, especially if, as is usually the case, the ventricular bands are in a state of chronic hypertrophy.

When syphilitic ulceration is combined with laryngeal tuberculosis, it is sometimes difficult, if not impossible, to distinguish accurately the separate processes from each other. As a rule the accompanying tuberculosis exhibits a greater tendency to sub-mucous infiltration of the parts that are particularly attacked or of those which are adjacent, and, as a

result, the mucous membrane becomes much paler in color. Corresponding to this, tuberculous softening, ulcerations also appear, with borders slightly elevated, and localized especially on the epiglottis, which is often thickened to a wonderful extent.

PROGNOSIS.

Simple syphilitic laryngitis, as well as that accompanied with the formation of condylomata, offers a good prognosis. In the simple ulcer, the results are less certain, inasmuch as this readily attacks the vocal cords after the epiglottis, and through a process more or less aggressive, the function of the vocal cords is sometimes very much altered or quite destroyed.

Moreover, in addition to the simple ulcer, severer, deeply penetrating forms, frequently appear; and these, as we have seen, may cause a complete closure of the larynx, and even a necrosed destruction of the laryngeal framework. Where a closure or neoplasm imperatively demands tracheotomy, the afflicted patients, with vigorous general condition, may continue to live with a measure of comfort. Even the vocal function can be restored, in a very imperfect manner, by the vicarious vibration of the ventricular bands that partially survive.

THERAPEUTICS.

A general anti-syphilitic treatment, especially in the form of large doses of calomel, is indispensable, even in laryngitis unaccompanied with ulcerative formations, and it is not contraindicated where there is suspicion of pulmonary tuberculosis. Only in those cases where the constitution of the patient has already suffered from the repeated use of internal and external mercurialization, or when the organism has lost its sensitiveness for this agent, should the iodide of potassium be substituted.

We have only to insist upon this, that during the general treatment, the topical application of nitrate of silver solution (3i-3ii. to aq. destil. 3i.), by means of the sponge, should not be forgotten. Especially in ulcerations that spread with rapid-

ity, it is indispensable to employ energetic cauterizations with very concentrated solutions of nitrate of silver, or with the same agent in substance, faithfully applied under the laryngeal mirror.

As soon as increasing narrowing is diagnosticated by means of the laryngeal mirror, we must carefully observe the derangements in the respiration, and if there be danger of their increasing in severity, tracheotomy should be instantly resorted to. In regard to the art of removing neoplasms through the mouth, we refer to the chapter on laryngoscopic chirurgical operations.

ŒDEMA OF THE LARYNX.

Œdema glottidis. (Bayle). *Laryngitis Submucosa.* (Cruveilhier.) *Laryngitis Œdematosa.* (Thuillier.) *Laryngitis Phlegmonosa.* (Bouillaud.) *Angina Laryngea Infiltrata.* (Sestier.) *Laryngitis sero-Purulenta.* *Laryngitis Submucosa Purulenta.* *Angina Laryngea Œdematosa.* *Angina Laryngea Infiltrata.*

Œdema of the larynx consists, in general, of an acute or rather chronic infiltration of the sub-mucous connective tissue of the laryngeal cavity. Although this œdema never appears as an idiopathic disease, but rather as a secondary symptom of a local inflammatory laryngeal affection, or of some other constitutional disease, and though, being an acute process, that in the majority of cases rapidly runs its course, it does not belong under the head of chronic diseases of the larynx, yet, on account of its great importance and danger, as well as on account of the frequency of its appearance in many affections of the larynx, we accord to it special importance.

The first name, given by Bayle, *Œdema glottidis*, was quite unfortunate. But it has been so adopted in literature, and is so frequently employed by physicians, that it will be very difficult to introduce another nomenclature.

And yet, since the laryngeal mirror has shed so much light on this affection of the larynx, we ought at least to strive to find a more accurate designation, and no longer to give a

name to the œdema from the part that is least attacked, but from the disease in its totality.

The name *laryngeal œdema* must be recommended as the shortest and most characteristic.

As is well known, the cavity of the larynx is covered with the *mucosa laryngis* on one of its walls, by means of sub-mucous cellular tissue, more or less firmly adhering to the mucous membrane that stands in union with the cavity of the throat.

Infiltration of the cellular tissue, just as swellings of the mucous membrane, may arise in all parts of the laryngeal cavity.

But the degree of the infiltration depends upon the greater or less relaxation of the sub-mucous tissue, and the loosening of the mucous membrane which is caused thereby.

The cellular tissue presents quite a thin and firm surface on the free border of the vocal cords.

It is thin and somewhat less firm in the ventricles of Morgagni, thicker and firmer in the inferior laryngeal space, on the inner surface of the vocal process, and on the posterior side of the epiglottis. On the other hand, it is relaxed on the posterior wall of the larynx, and on the Lig: ary-epiglottica, and on that account, they are especially liable to œdematous swellings.

In the light of these anatomical and histological facts it is sufficiently evident why œdema occurs most frequently and most markedly on the part that lies above the chink of the glottis, (as is confirmed by the anatomical and pathological and laryngoscopic appearance,) and also why the name *glottis œdema* is the least appropriate.

Some authors describe separately two varieties of morbid processes, and represent glottis œdema, as a simple sero-hydroscopic infiltration, in distinction from laryngitis sub-mucosa, which is a sub-mucous infiltration of the larynx caused by inflammation. They consider then the latter form as analogous to the phlegmonous process. Such a division is just as unwarranted as the other nonomenclature above described, in which the different etiological elements with their products

appear confounded together, and according to which certain authors have distinguished the secondary œdema from the predominant, primary disease.

For example, when œdema of the larynx occurs in the course of a perichondritis, the anatomical, pathological appearance, naturally corresponding to the original disease, must be very different from that which obtains when the œdema is caused by an acute inflammation of the mucous membrane, or through scarlet fever. Thereby the œdema is not varied in its main features, but the infiltration may be more purulent, or purely serous.

ANATOMICO-PATHOLOGICAL APPEARANCE.

The infiltrated cellular tissue presents a serous, or sero-purulent fluid, which, corresponding to the firm or relaxed quality of the connective tissue, is found most abundantly on the ary-epiglottic folds, the posterior wall of the larynx, the arytenoid cartilages, the ventricles of Morgagni, and the epiglottis. The ary-epiglottic folds become very greatly increased in size, and appear as elastic or flabby pale swellings of large extent, which may sometimes entirely close the glottis.

The portion lying below the vocal cords, on account of the firm adherence of the tissue of the mucous membrane, is very rarely the seat of marked infiltration.

On the other hand, the œdema sometimes extends above upon the pharynx, on the soft palate, and the uvula. On incision the infiltrated parts discharge a clear, serous, or dark, sometimes yellowish fluid, on which the swellings may either fully collapse, or the meshes of the connective tissue on the incised surfaces may present a gelatinous appearance. The character of the infiltration depends on the intensity and duration of the affection, as well as upon the constitution of the patient.

The muscles lying beneath the cellular tissue are discolored and softened, when the infiltration becomes more purulent in character, and is complicated with the original local

disease. In long-standing cases, the sub-mucous connective tissue reaches a certain grade of thickening and hardening, while there are unmistakable signs of inflammation of the mucous membrane.

SYMPTOMS AND COURSE.

Inasmuch as œdema of the larynx does not occur as a spontaneous acute disease, but rather in all cases depends on some other affection of the larynx, we can readily conceive that in many cases it must be preceded by symptoms which have no connection with œdema of the larynx as such, but which have reference to the original affection, and yet a manifest increase of volume cannot always be considered as œdema. Notwithstanding, in a certain number of diseases, as we shall see later on, it is always necessary to have regard to the possibility of a sudden attack of œdema.

The first symptoms that make themselves felt, are a narrowing of the larynx. The patient experiences usually a pricking pain in the larynx, and suddenly, or gradually, an interference in the inspiration, which is accompanied with a rough, croupy, or piping tone, while the expiration is very easy, oftentimes in no way hindered.

According as the œdema increases in intensity, there is a feeling as of a foreign body in the larynx, or as if a cord were drawn about the neck. The deglutition becomes more difficult, and there is a great want of air, which, in a shorter or longer time, becomes paroxysmal. The voice thereby acquires a rough, hoarse tone, although the œdema only extends on the upper aperture of the larynx; but on the other hand, complete aphonia occurs, if in addition the inferior portion or this alone be attacked. Coughing and pain are not always the necessary accompanying symptoms of the morbid process. The power of swallowing is often disturbed to such a degree that every attempt to gulp down the offered fluids miscarries, and even causes a violent regurgitation through the *choanen*. The disproportion between expiration and inspiration excites a cushion-like infiltration of the ary-epiglottic folds. These,

through their remaining mobility, allow the expiration to go on, by their mutual separation, while they lie against each other as the stream of air enters, and almost close up the cavity of the larynx.

But the expiration also appears to be materially interfered with in cases of œdema that are quite severe above and beneath the glottis, and especially when the infiltration presents a tense, firmer appearance.

In regard to the course of the disease in general, we may say that an apparently mild laryngeal affection, or a convalescence that is advancing with favorable symptoms is sometimes transferred into an intensely acute form, that results in speedy death. In such cases, the serous character of the œdema predominates.

In the majority of cases, however, the disease is not so sudden in its attacks, and its course is more chronic.

Mild forms of œdema may exist for a long time, alternately diminishing and increasing, as we have especially observed in phthisis laryngealis.

If suffocative paroxysms occur, the breathing becomes exceedingly difficult, and is accompanied by convulsive inspiration. Such attacks may continue for several minutes, and after a longer or shorter interval, may recur with still greater intensity.

If the dyspnœa advances to the severest stage, the patient, bending forward the thorax, seeks to gain the greatest possible space for inspiration, and, evincing the greatest agony and despair, he thrusts his hand into his mouth, even deep into the throat; the face becomes cyanotic, the extremities cold, the pulse small and frequent, and he may die from asphyxia. Sometimes these painful symptoms are also accompanied by general convulsions.

If the patient overcomes such an attack, the respiration will be freer for some time, and soon a comatose condition will result, the pulse will be irregular, and death may ensue, with the symptoms of œdema of the lungs caused by overlading of the blood with carbonic acid.

If the issue be favorable, and if the œdema has not de-

pended on an incurable disease, complete convalescence will follow, often in a comparatively short time.

ETIOLOGY.

Œdema of the larynx is more peculiar to adults than to children. It is more frequently experienced by men than by women, and according to the statistics of Sestion, is most common, between the age of puberty and thirty-five. Before the thirtieth year it occurs as the result of acute diseases ; after this period it accompanies chronic affections of the larynx. An idiopathic œdema has not yet been observed with certainty. Only in quite isolated cases is the œdema observed as a participating symptom in general hydropsy, or in a hydropsic diathesis.

Most commonly the œdema occurs collaterally, because the capillary stasis of the inflamed parts causes a transudation in the sub-mucous tissue.

Among the acute diseases that cause this, belong the exanthemata, especially scarlet fever in the period of desquamation, typhus in the period of convalescence, inflammation of the spleen, Bright's disease, scurvy, wounds in the throat, or phlegmonous inflammations of the outer portions of the throat, of the parotid gland, the tongue, the tonsils, or the pharynx, that extend themselves upon the tissue of the larynx. It sometimes occurs after the removal of cervical tumors.

As a result of mechanical and chemical irritation, we see that œdema is not seldom caused by the burning of hot drinks, or of mineral acids. Œdema is also observed in surgical operations on the larynx in the course of traumatic inflammation.

The English physicians give prominence to its metastatic appearance in facial erysipelas, and name it "Laryngitis Submucosa Erysipelatosa."

Most commonly the chronic affections of the larynx predispose to œdema of the larynx, and it is just here where for a long time an œdema of mild form may exist, that must keep

us always prepared for a rapid increase. Among these diseases belong tuberculosis, syphilis of the larynx, laryngitis chronica, ulcerosa, and laryngeal perichondritis.

Among remoter causes we enumerate finally, tumors of the throat and the larynx, formations of cicatrices, and aneurisms of the aorta, in so far as these, through mechanical pressure, cause a disturbance in the circulation of the blood, especially a reflux into the veins of the larynx.

All these symptoms of disease favor the existence of œdema, if the patient be at the same time a cachectic, weakly individual, and is thereby especially disposed to hydræmia.

GENERAL DIAGNOSIS.

Edema of the larynx belong to those affections in which, at least, the ocular inspection of the pharynx, and the palpation of the epiglottis, that is, the *ostium laryngeale* in many cases can be relied on with approximative certainty.

If the parts of the pharynx present an œdematous infiltration, and the symptoms of difficult respiration arise, we have very good reason for suspecting œdema of the larynx. For the purpose of ocular inspection, we cause the tongue to be forcibly stretched out and press the root down energetically and rapidly by means of a broad tongue spatula.

In the course of the retching that ensues through the irritation of the roots of the tongue, and the necessary projection upward of the larynx, the epiglottis as well as the infiltrated ary-epiglottic ligaments become momentarily visible to the observer. There is not an equal amount of success in performing this act in all cases, and the result depends upon the capacity the throat of each individual. However, an increase in volume of the parts of the larynx caused by œdema favors the inspection much the more, as we can readily see the epiglottis in certain cases in healthy individuals, through the above-mentioned manipulation.

When this manœuvre does not succeed, the palpation by means of the index finger, suggested by Thuillier, is recom-

mended. We feel our way along by the roots of the tongue, and endeavor to grasp hold of the epiglottis. The whole operation, on account of the great sensibility of this portion of the throat, must be performed more rapidly and surely than the depression of the tongue, inasmuch as a suffocative attack usually directly follows.

When the œdema is found on the other side of the vocal cords, both methods of investigation naturally have no value.

Among the subjective symptoms, pressure and pain in the larynx, as well as painful inspiration, together with protracted whistling expiration, afford a very uncertain basis for diagnosis, even if, through an accurate history of the case and pathogenetic data, we exclude the integrity of those organs which may possibly cause dyspnoetic symptoms, and such other affections as pure nervous spasm of the glottis, and also various neoplasms in the larynx, that, according to their insertion, can give rise to quite similar symptoms.

In case diseases of the larynx are already present, especially those of the chronic variety, such as phthisis laryngea and perichondritis, if these be diagnosticated beforehand, we can, in case of an attack of difficult respiration, conclude, at least with considerable probability, upon the existence of œdema of the larynx; and the misproportion between inspiration and expiration, depending on such causes, will have great pathognomonic value.

With regard to the differential diagnosis, we may remark that the symptoms of difficulty of respiration are similar in retro-pharyngeal abscess, but are less paroxysmal. At any rate, the abscess can, in most cases, be reached with the index finger.

In croup, the subjective symptoms do not essentially differ from those of œdema. The difference chiefly lies in this, that œdema of the larynx prevails with adults, while croup almost always attacks children.

LARYNGOSCOPIC DIAGNOSIS.

Laryngoscopic examination in œdema of the larynx is not entirely an easy matter, especially if the parts of the throat

are at the same time infiltrated. It demands, on the part of the examining physician, a certain grade of skill and rapid and adroit introduction. With these conditions he may succeed, even in the most difficult cases, in making a strict diagnosis without greatly harassing the patient.

In this connection, where the value of laryngoscopy is manifested in the most brilliant manner, I must object to the objection which certain authors make, with reference to the examination with the mirror in this and similar diseases of the larynx, when they call the operation a cruel one. However, these critics have only an imperfect knowledge of the laryngoscopic art, or they are familiar only with a very primitive method of laryngoscopy. Although the laryngoscopic examination may readily cause some inconveniences to very feeble patients, should that, therefore, keep us from examining the morbid process in its totality? Does the surgeon neglect to introduce the catheter merely on account of the unpleasantness of the procedure, when the sound indicates the formation of stone?

We find the œdema the most decided, corresponding to the anatomical proportions of structure, where the sub-mucous cellular tissue shows a greater state of relaxation, and a thicker structure.

In bad cases, we discover, on the introduction of the mirror, nothing but the epiglottis, lig. ary-epiglottica and arytenoid cartilages, as infiltrated, thick swellings. The ventricular bands, the Morgagnian ventricles, and the vocal cords, are entirely concealed.

The color, in the more acute form of inflammation, very well corresponds to œdema of the prepuce, while an œdema occurring after chronic larygeal affections, presents more of a dirty white color.

Secretion is usually not present in acute œdema, or is only of a frothy quality. In cases of an opposite character, it is of a tenacious, sometimes purulent description.

The arytenoid cartilages, and the ary-epiglottic folds either do not move at all, or they exhibit only a trifling separation in expiration.

In less striking cases, where the œdema selects the deeply lying parts, and is particularly confined to the vocal cords, these appear as dirty gray or as reddish swellings. Thereby the arytenoid cartilages and the posterior wall of the larynx are always more or less affected, so that their mobility appears to be much impaired, both in inspiration and in expiration. Less frequently, the œdema is confined to the larynx and lower half of the epiglottis.

Where the infiltration only attacks the sub-mucous and mucous membrane tissue lying beneath the glottis, then the vocal cords, as a rule, lose their sharp edges, and we see, beneath and between them, serous swellings, or a projecting ring of the color of pale mucous membrane.

If the upper border of the epiglottis is alone infiltrated, this is seen, by means of the mirror, like a rose-colored swelling, projecting up over the roots of the tongue or directly behind.

After those chronic affections of the larynx where loss of substance has already taken place through ulceration—such as syphilis, tuberculosis, perichondritis—the resulting œdema presents a peculiar appearance. We see shaggy prominences with ulcerated surfaces lying behind them, secreting a tenacious, or dirty, watery matter.

If we have the opportunity of making a laryngoscopic examination after the œdema has been scarified, or after spontaneous absorption has taken place, the mucous membrane of the larynx appears to be folded and wrinkled, just as is seen in the mucous membrane of the prepuce after incisions. This appearance is particularly marked on the ary-epiglottic folds.

PROGNOSIS.

The prognosis is always in the highest degree unfavorable, and may be regarded as utterly bad when the œdema depends on, and is called forth by diseases that threaten the life itself. According to this standard, the value of tracheotomy must be estimated. When the œdema takes place in the course of typhus, variola, erysipelas, scurvy, or aneurisms of the

aorta, the course is usually protracted just as in general dropsy and tuberculosis. The conditions are more favorable when the œdema exists in individuals otherwise strong and well nourished, in whom the predisposing disease has existed only for a short time—as œdematous angina—and when seasonable and appropriate treatment introduces surgical aid.

THERAPEUTICS.

There are many remedies that are recommended against this dreadful disease. We shall allude to those most employed, and then discuss the surgical treatment as the *ultima ratio*. In general we obtain meagre results, or none at all, from medical treatment, the disease having such a rapid course, that medicines do not act with sufficient rapidity.

Nevertheless, in young and vigorous individuals, at least, we should not neglect to make the attempt to avoid the threatening peril by energetic medication before we proceed to tracheotomy. We usually recommend in such cases free bloodletting, in connection with powerful derivatives, especially with croton oil—from $\frac{1}{4}$ to $\frac{1}{2}$ a drop hourly—in order to bring about reabsorption of the local infiltration, by a marked diminution both in the total quantity of the blood and of its capacity of holding water.

After croton oil, *calomel* is to be decidedly recommended.

I have not been able to obtain any positively marked results from local bloodletting, even when 20 cups were applied. We may also regard the vesicants, so very much praised by Sestier, as much too slow in their effect, since it is necessary that help should be obtained in a short time.

In individuals whose constitutions are more or less weakened and changed through the protracted local or general diseases mentioned under etiology, we shall make heavy drafts on their yet remaining strength, if we resort to the vigorous use of the antiphlogistic apparatus. We therefore, in such cases, make use of the application of a small number of leeches, and place on both sides of the larynx broad and long strips of vesicating plasters.

I regard an emetic as quite dangerous in these cases; the patient may become suffocated, or in a very short time exhausted, by the act of vomiting.

In both instances, in the robust as well as in cachectic patients, the symptoms of œdema preceptibly increase, as can be readily observed by local examination. We must not, therefore, delay to make use of surgical means, and scarify the infiltrated swellings, or increase the opening of the air-passage before suffocative paroxysms reduce the general condition, through alteration of the nerves, or before there comes a sudden end to the remedial efforts.

Scarification is best performed by stretching out the tongue; and, with the best possible illumination, introducing over the epiglottis a knife with a bulbous extremity, moderately curved and sharp only on its extremity, moving it backward and forward, making a number of incisions on the ary-epiglottic folds, and on the epiglottis itself. When at the same time considerable infiltration of the throat exists, the stretching out of the tongue is rendered difficult, or quite hindered. In such cases we introduce the knife under the guidance of the left index finger, to the particular spot desired.

We should resort to the imperfect operation recommended by Legroux of letting out the fluid, by means of a sharp finger nail, only in those cases where a convenient instrument is not at hand, as the whole manipulation is exceedingly harassing to the patient, and even a very long index finger does not penetrate deeply enough into the œdematous parts.

If scarification does not relieve rapidly enough, or if the œdema appears on a part that cannot be reached—the other side of the vocal cords, for example—only tracheotomy, that is to say, laryngotomy, remains, if we have decided beforehand that the vocal cords are not attacked with the infiltration.

The pencilling with nitrate of silver, recommended by Green and Watson, appears to have no effect in diminishing the œdema in stages already advanced.

But if tracheotomy or scarification have previously averted

the immediate danger, the local application of these remedies has a marked effect in the rapid contracting of the mucous membrane. Under such conditions, also, the application of vesicants that are followed by abundant purulent secretion, has a decided effect in promoting the re-absorption of the transuded fluid.

In conclusion, I very particularly recommend the earliest possible opening of the air passage as the best course for all such cases where the patients are vigorous, and where no dyscrasia is the cause of the affection. Tracheotomy is not, in itself, a very formidable operation, and is accompanied with quite good results, where no persistent dyspnoea or repeated attacks of suffocation have caused a depression of the whole nervous system.

ABSCESS OF THE LARYNX.

Without regard to those abscesses that depend on perichondritis (such as are observed in typhus, tuberculosis, and syphilis, and are mentioned under the chapter on perichondritis), circumscribed primary purulent formations quite rarely occur in the sub-mucous tissue of the larynx as abscesses in a surgico-pathological sense. Such abscesses, when they occur, as a rule run quite a rapid course, and therefore, as belonging to acute diseases, are excluded from discussion in this place.

The importance and life-threatening character of such an occurrence, demands that we should devote a few words in regard to it, since laryngoscopy affords important indications for effective therapeutic procedures.

Simple primary abscesses of the laryngeal cavity, present a certain defined form and are the results of inflammations of glands of the mucous membrane or of the mucous membrane of the larynx itself. According to the laryngoscopic examinations that have been made thus far, they occur most commonly on the cushion of the epiglottis, or on the ary-epiglottic folds which abound in glands, and in the Morgagnian ventricle, on one or the other side.

SYMPTOMS AND COURSE.

The subjective symptoms are a more or less burning, oppressive and weary feeling in the throat, which causes the patient to avoid swallowing as much as possible.

The patient is not always able, from the feeling of tickling and pain in the throat, to decide with certainty which side is affected. The abscess does not give rise to the irritation of coughing, but it may cause considerable disturbance in the voice, and in severe cases, may cause aphonia and difficulty of respiration when the larynx becomes narrowed.

The expectoration that results from the secretion has nothing in it that is characteristic, although the sputa appears to be mingled with small streaks of blood. This may come from the bursting of inflamed, disturbed capillary vessels of the mucous membrane.

Accompanying febrile symptoms are hardly perceptible.

All these facts, although they may show to an attentive observer that there is intra-laryngeal difficulty, afford a very uncertain basis for diagnosis, since similar complaints and statements on the part of patients are made in other diseases of the larynx. The mirror alone can make clear to us the nature of the disease.

With regard to the course, the formation of the abscess may reach maturity in eight days from the beginning of the first complaints. The pus may be discharged after gradual increase of the subjective symptoms, either spontaneously with explosive coughing, or as the result of an emetic, that is to say, by therapeutic assistance.

ETIOLOGY.

Abscess of the larynx may depend on the same cause that give rise to acute and chronic laryngitis. Among the causes, are particularly to be mentioned taking cold, over-exertion and mechanical irritation of the larynx. Abscesses of the larynx are also observed as a result of previous inflammations of the pharynx.

LARYNGOSCOPIC DIAGNOSIS.

The abscess, even though it has not fully reached maturity, appears as a tense red, glistening swelling, resembling an oedematous prepuce. When farther advanced it appears as a yellowish, transparent, pointed cone. According to the situation of the abscess and its size, the peculiar change in the form of the laryngeal space will be observed. On the swelling of the epiglottis such an abscess covers the anterior portion, and even the greater part of the vocal cords. When it occurs on the lig:ary-epiglottica, or in the Morgagnian ventricles, the vocal cord concerned is entirely hid from view by the co-existing inflammatory swelling around it. In this way the mobility of the arytenoid cartilages becomes seriously impaired through the mechanical effect.

The examination must be undertaken with the greatest caution, and with the largest possible indulgence of the patient, inasmuch as the stretching out of the tongue and the resulting movement of the larynx, as well as the application of the mirror in the usually co-existing hyperæmic condition of the throat, increase the intra-laryngeal difficulties.

PROGNOSIS.

The prognosis, with the use of the laryngeal mirror, is favorable. Even an increasing narrowing of the larynx can be watched over with certainty, and threatening suffocation can be avoided in due season by therapeutic measures. No complaints or disturbances of functions of any kind remain after abscesses. After the swelling diminishes, the neighboring parts resume their normal functions.

THERAPEUTICS.

As the spontaneous formation of abscesses begins with the symptoms of acute laryngitis, in those cases where the laryngoscope cannot be used, and when no certain conclusion can

be reached, it is best to commence with an expectant plan of treatment, while waiting for further symptoms.

At all events, I discourage the employment of local blood-letting, inasmuch as, according to my experience, it is entirely useless. As a drink, I recommend the popular Seltzer-water, with hot milk. If the symptoms are more positive than usually obtain in acute laryngitis, and if they manifest themselves by a severe, fixed pain in the larynx, the laryngoscope must then ascertain the cause.

If tension and prominence of the mucous membrane appear, or if the abscess is readily distinguished by its yellowish, dull color, the course for us to pursue is to bring it to maturity by the use of warm water. While the exterior of the larynx is covered with cataplasms, let the patient at the same time hold warm gruel in the back of the mouth as long as possible.

If the mirror shows that the process of maturation of the abscess is to be a tedious one, we can, in a knife-fearing patient, cause it to burst by means of an emetic.

The most certain method, however, is to open the abscess under the mirror with a knife that is pushed out from a canula.

Tracheotomy is not usually indicated in the formation of abscesses, with our present diagnostic appliances, unless it happen that the physician is not called until attacks of suffocation have already set in, or it is impossible to use the laryngoscope.

SECTION IV.

DISEASES OF THE PERICHONDRIUM AND THE CARTILAGE.

Perichondritis and Chondritis laryngea.

Thirty years ago, perichondritis was described by Albers as a morbid process arising spontaneously. But he only directed his attention to the laryngeal abscesses, the products of this inflammation, without even ascertaining with accuracy where the pus was formed.

Inasmuch as the disease of the cartilage itself, (if we except senile ossification), never arises idiopathically, but appears to depend on pathological changes of the perichondrium, we treat both forms of disease together. In regard to the relative order in which the several cartilages are most frequently attacked, we observe that perichondritis cricoidea is most common, next perichondritis thyroidea arytenoidea and then that of the epiglottis. Whether the perichondritis arytenoidea occurs as a primary disease, is not yet fully determined.

It seems as though the process were more a secondary product of the idiopathic inflammation of the mucous membrane and of the sub-mucous tissue, and accordingly, on account of the frequency of laryngeal tuberculosis, and of the diseases of the arytenoid cartilages, caused thereby, perhaps perichondritis arytenoidea took the precedence in the classification.

ANATOMICO-PATHOLOGICAL APPEARANCE.

In the spontaneous (the so-called rheumatic) disease, we observe in the first place a perichondritis of the cartilaginea

cricordea, from which the process extends upon the tissue of the other cartilages. On that account, the first formation of exudation is between the cartilage and the perichondrium.

The latter soon forms a sac of pus in the surrounding parts, and the cartilage through continued contact with the fluid of the abscess, acquires a rough, discolored appearance on its upper surface, becomes partly macerated and loosened in its points of union. In the parts surrounding the abscess, the submucous tissue presents a hard, subsequently a serous infiltration.

After breaking through the perichondrium, the pus extends upon the sub-mucous cellular tissue of the laryngeal cavity, and finally perforates the mucous membrane itself. Discharge of pus follows, at the same time necrosed pieces of cartilage are coughed up, or are thrown into the chink of the glottis, and even into the bronchi, and may cause choking sensations.

Sometimes the pus forces its way into the pharynx and forms a laryngo-œsophageal fistula. The contents which before the rupture are like pus, after perforation resemble a caustic, stinking ichor, as a result of contact with the air.

If pus be formed in the periphery of the laryngeal cartilage, this may work its way into cellular tissue of the external integument and after forming abscesses and callous fistulous openings, may find exit. In this way necrosed fragments of cartilage may be brought to light.

In rare, very isolated cases where a stasis occurs in the purulent process, after the expulsion of some fragments of cartilage, the filling up of the pus cavity will be brought to a stand by the formation of a dense fibro-callous tissue. Both processes, neoplastic formations of pus, as well as of connective tissue, may go on at the same time near each other.

In the very frequently occurring consecutive perichondritis, the pathological process is exactly the same, only in inverse order, and is called forth by affections of the mucous membrane, especially attacks of laryngitis, syphilis, and tuberculosis.

The metamorphosis that takes place in the cartilage through exudation, may consist in an ossification with preceding softening, as well as in an atrophy.

According to Albers, even a primary inflammation may arise from ossified cartilage, and then a secondary perichondritis may arise through formation of pus.

The hyperostoses that are observed after syphilis, cause a narrowing and deformity of the cavity of the larynx.

In regard to the existence of spontaneous inflammation of the epiglottis, authors are divided. According to my observations, I am decidedly convinced that a spontaneous attack of a chronic inflammation of the perichondrium of the epiglottis may arise, though such cases are quite rare.

The existence of various deformities, as atrophy, shrinking of the epiglottis, with the distinctly marked forms of a deeply penetrating inflammation, while the other portions of the larynx are entirely intact, speaks clearly enough in my opinion for the acceptance of the theory of an isolated inflammation.

Caries is usually a secondary product, and is caused in the majority of cases, as has already been indicated, through a tuberculous ulcer, since this extends from the mucous membrane and attacks the perichondrium.

If the cartilage has not undergone ossification, it now gradually wastes away beneath the caustic pus.

But if ossification has already commenced, this of course takes part in the further destruction. The cartilages being then more or less attacked with caries, appear eroded, rotten, or have a dark-brown color.

Necrosis of ossified cartilages runs the same course as in every other kind of bone substance, and when it occurs, it advances in a process of cure through new formations of masses of bone. If the cartilage, on the other hand, be not yet ossified, the result is that it becomes gradually resolved, with very offensive odor.

SYMPTOMS AND COURSE.

In the first stages of the disease, the symptoms are the same as in every other inflammatory affection of the larynx. Even the very great pain in the larynx, concentrating itself in

a limited space, affords very uncertain evidence, and the co-existing swelling of the glands, which in many cases is very prominent, affords little that is characteristic.

As the secretion increases, in the course of a very great and gradually advancing tension and dilatation of the perichondrium, deglutition becomes difficult, and the voice becomes changed, with attendant cough.

Palpation and displacement of the framework of the larynx causes intense pain as the perichondrium more and more dilates, perforation ensues, and the pus overflows into the sub-mucous tissue, causing immediate increase of the swelling. Symptoms of dyspnœa may arise at once, and the disease may advance to the characteristic symptoms of narrowing of the larynx.

With these symptoms death from suffocation can result in a short time.

In favorable cases the narrowing of the larynx does not at once reach a higher grade, but the process advances tediously; the collected pus gradually perforates the sub-mucous tissue, and, with severe paroxysms of coughing, there follows expectoration of pus, also of ordinary secretion, and sometimes of necrosed fragments of cartilage.

If, while this process is going on, a small or large fragment gets between the vocal cords, or deep into the trachea, either death by suffocation may take place, or a tedious disease of the lungs may result.

On the other hand, with the purulent perforation, all the harassing symptoms may disappear at once, and a gradual healing may take place, while recession of the morbid process may result, with scarcely perceptible symptoms of local disturbances.

In the majority of cases, however, and when the disease that occurs as a result of consecutive perichondritis predominates, the patient succumbs partly to the primary disease, partly to the co-existing local process terminating in hectic fever before the perichondritis advances to a higher stage; or in other cases, to a sudden attack of œdema of the larynx.

If the overflow of pus has forced its way outward into the

cellular tissue beneath the skin, the symptoms are quite evident, and in many cases the abscess may be successfully opened by a surgical operation. A partial sinking in of the framework of the larynx, and consequent mechanical closure, is rarely observed.

In regard to the special symptoms that indicate the existence of the disease in the different cartilages, it is observed that in the cricoid cartilage the inflammation appears particularly on the broad, posterior portion, and thereby favors perforation into the œsophagus.

There is also a pricking pain in swallowing, especially of hard substances, if these pass by the inflamed spots. The thyroid cartilage is usually attacked in larger extent. If the process be more localized on the anterior surface, the contour of the cartilage perceptibly dwindles, and it is quite painful, on contact.

The disease of the arytenoid cartilage is usually marked through alteration in the voice, which can go on to complete aphonia.

The closing of the glottis is thereby rendered imperfect, and the deglutition and expectoration are painful. Inflammation of the epiglottis is characterized by a severe, persistent pain, with every act of deglutition.

ETIOLOGY.

Perichondritis laryngea, is, fortunately, a rare disease. It occurs more frequently as a secondary, than as an idiopathic disease, and more frequently attacks men than women. Children are more liable to it than adults.

The affection, when primary, is said to be of a rheumatic origin, and the disease is therefore termed *phthisis laryngealis rheumatica*. Sometimes simply taking cold must be regarded as an exciting cause. Simple *incised* wounds of the cartilage, without contusion, such as opening the thyroid cartilage for the removal of polypi, etc., recommended by Ehrman, do not appear to give rise to perichondritis.

By some authors, excessive and long continued straining

of the organs of speech, is regarded as a cause of perichondritis.

The primary disease most frequently attacks the cricoid cartilage.

Secondary perichondritis usually arises from typhus, variola, tuberculosis, syphilis, and mercurial cachexia, and the arytenoid cartilages are most frequently attacked.

DIAGNOSIS.

The so-called rational diagnosis—that is, one founded on the symptoms and external probabilities—will be established only with positiveness in those cases where a secondary abscess is formed on the thyroid or cricoid cartilages, or a rough condition of the cartilage can be ascertained by means of the sound through an existing fistula.

The coughing up of purulent, offensive sputa, mingled with fragments of cartilage, taken in connection with other symptoms, makes us certain in regard to the nature of the disease, but always leaves it undecided to what extent the local affection has reached and where its seat may be.

Here, however, the laryngoscopic diagnosis may afford a most accurate conclusion. I will therefore remark, beforehand, that in the first stages we shall have some difficulty in distinguishing perichondritis from a severe swelling of sub-mucous tissue. But yet, for the practised observer, a prominent difference can be ascertained with approximate certainty. Before abscesses are formed, the mucous membrane and sub-mucous tissue of the affected parts exhibit quite elastic and more or less projecting prominences, and swellings of livid, dirty red, often grayish-brown color, while the contiguous mucous membrane appears affected with inflammation. I believe that in this stage a difference in color can be readily found between the primary and the secondary disease, without regard to the locality. The primary perichondritis is characterized by a comparatively fresh color in the border. The mucous membrane appears firm.

The parts that are disposed to form abscesses are clearly perceptible, and are of a dark red, livid color; while in secondary perichondritis the entire local image gives the impression of a very much swelled, softened, grayish-brown mucus.

When the thyroid cartilage is attacked, there appears a much enlarged, elastic swelling of the epiglottis, and inflammatory swelling of one or other ary-epiglottic fold, of one of the ventricular bands or vocal cords, according as the seat of the disease is upon the right or left lamina of the thyroid cartilage.

An affection of the anterior portion of the Arcus cartilaginis cricoideæ can be recognized by means of the laryngeal mirror, only when the cavity of the larynx is well formed, and there is abundant mobility of the vocal cords.

On the other hand, disease of the posterior portion of the lamina of the cricoid cartilage, is diagnosticated with comparative ease.

The marked redness and swelling begin on the posterior wall of the larynx, thereby hindering the closure of the epiglottis, and can be distinctly traced in its progress downwards.

Where the disease attacks the arytenoid cartilages it characterizes itself by a prominence of the anterior, inner surface, and by an inflammatory swelling that occupies the posterior portions of the ventricular bands and vocal cords. Thereby the mobility of the cartilage is essentially hindered, and, as a secondary result, it happens that the action of one or other of the vocal cords is sometimes reduced to a minimum.

If the abscess has already broken through, we observe around about it a callous, dirty, discolored border, of greater or less extent, oftentimes very small, but readily perceptible in its depth, in which either necrosed connective tissue or discolored gray cartilage are visible.

The epiglottis is thickened in all cases. It is of a deep red, shiny color, as if the mucous membrane had become sclerosed, and suffered deformity, causing it to appear somewhat trough-shaped. Its mobility is impaired, and its position appears exceedingly rigid.

The prognosis is unfavorable where a serious, dyscrasic affection lies at the basis, as is the fact in the majority of cases. Primary perichondritis affords far better chances, inasmuch as where abscesses are formed, especially if these find their way externally, the morbid process sometimes can be brought to a stand-still, and resolution may take place.

THERAPEUTICS.

Although in this severe form of disease we cannot take as successful measures as in other diseases of the larynx, yet our improved means of diagnosis offers us a more definite basis for a rational therapeutic procedure than before the introduction of the laryngoscope.

The first local inflammatory symptoms will demand an antiphlogistic treatment corresponding to each individual case. Local bloodletting, energetic derivatives through vesicants and moxas, are indicated.

In progressive narrowing of the laryngeal cavity and threatening formations of abscesses, we either give an emetic that will be surely efficacious, or, if the local condition allows, we resort to excision with a covered knife, under the guidance of the laryngoscope.

If the emetic be unsuccessful, and it is not possible to open the abscess by a surgical operation, and if the symptoms of dyspnœa progress to a critical extent, tracheotomy is the last refuge. This indeed, however, will be only a palliative in perichondritis that is caused by a dyscrasic basis-disease, especially tuberculosis. When an abscess forms threatening to open outward, the incision must be made as soon as possible.

The touching of the cavity of the larynx with nitrate of silver, etc., will be of great service, as well before as after the formation of abscesses.

After abscesses have formed, the local cauterization contributes, in a marked degree, as experience teaches us, towards cleansing the ulcerated spots, and diminishing the surrounding swelling.

For the affection of the epiglottis, the local treatment of touching with solutions of tannin or nitrate of silver is the only resort, and is usually accompanied with good results.

A corresponding general treatment will have to be adapted in every individual case to the existing disease, which lies at the basis of the affection.

SECTION V.

DISEASES OF THE NERVES OF THE LARYNX.

Diseases of the Nerves of Sensation, Spasmodic Coughs, and Nervous Pains of the Larynx.

THE hyperæsthesia and anæsthesia that belong to diseases of the nerves of sensation, and also the morbidly increased or diminished sensibility of the nerve-fibres, have, until recent times, been mentioned exclusively as symptoms of other fundamental diseases, and therefore have been treated only superficially.

The existence of an anæsthesia can, in general, be regarded only as problematical. At least, we have not hitherto succeeded in ascertaining to our satisfaction that such exist, or that they can be produced artificially. On the other hand, we declare, with positive certainty, that hyperæsthesiæ may arise spontaneously on the mucous membrane of the larynx, just as hyperæsthesiæ of the skin may exist independently of any central disease.

We believe, therefore, that we shall be justified in discussing spasmodic cough and nervous pains of the larynx by themselves, as idiopathic diseases.

There are not a small number of patients who are tormented by the most severe pains in the larynx, and the most violent paroxysms of coughing, when we are not able to ascertain the existence of disease in any other organ of the body (including the uterus in women), even after the most careful examination; and no local seat of the affection, at least no inflammatory state of the mucous membrane, can be diagnosed by means of the mirror.

We can almost consider anæmia of the mucous membrane of the larynx as the *causa efficiens*, in contrast to those hyperæsthesiæ excited by inflammatory conditions, inasmuch as under this appearance the most distressing diseases of the larynx not seldom occur. But the same morbid appearance may exist to a most striking degree when this symptom is entirely wanting.

Hyperæsthesia of the mucous membrane of the larynx, in the majority of cases, is benefited by the local application of remedies, and by the use of the constant current of electricity.

I regard the so-called nervous coughs, hitherto treated of by Rühle, as a form of disease which depends neither on anatomico-pathological changes in the larynx itself, nor yet on any other basis disease, but as caused solely by reflex irritation.

If we consider that the distribution of the nerve-fibres of the laryngeus, in the tissue of the mucous membrane of the cavity of the larynx, is very extensive, and that in many ways it is subject to irritation, it appears far from singular that here, just as in other nerve ramifications, reflex actions may readily be excited from the periphery.

Nervous (also called spasmodic) coughs have nothing in common with those that are designated hysterical. They are characterized by paroxysms that occur with extraordinary violence. These attacks are separated from each other by long and entirely free intervals. They often appear at certain hours of the day, and are excited by other causes than the various forms of cough that depend on morbid changes of the mucous membrane of the respiratory tract.

According to Rühle, before, during, or after the attack, prominent symptoms of irritation—usually quite distinct convulsions, sometimes local, sometimes general—also appear in other nerve tracts. Thus far, I have not observed this. There is usually no expectoration.

In the majority of cases, I have met with nervous coughs in old women; in isolated cases also, in young, otherwise healthy maidens. In men, I have very rarely observed this form of disease.

Most of the patients were generally vigorous and healthy. Neither the so-styled general nervous debility, nor an organic change or inflammatory process in the sexual apparatus, can generally be diagnosticated. In some cases, I was inclined to regard a strikingly anæmic condition of the mucous membrane of the larynx as the chief disease. Perhaps the nerve-fibres in anæmic mucous membranes are more inclined to hyperæsthesia.

The prognosis is generally favorable. If the disease sometimes has a very obstinate course, we can yet secure, with positiveness, a favorable result, by local medication.

THERAPEUTICS.

Patients with nervous cough belong to those annoying cases which, it has hitherto been supposed, could only be treated by narcotics and derivatives.

My treatment was based upon the idea that the irritability of the mucous membrane, with the nerve extremities that run through it, could be blunted by touching with the sponge, and by the constant current of electricity.

The results were so manifest, that I have since treated nervous cough chiefly by local measures. I therefore lay special stress on the employment of a sponge, since thereby the walls of the mucous membrane are touched in a mild and uniform manner, and all harsh irritation, as in the use of a pencil, is avoided.

It is evident that one should not always expect striking results in a short time. In deeply rooted, long-standing cases of hyperæsthesia, the cure often demands months of treatment. The condition begins to improve, however, in the first week.

If the mucous membrane be anæmic, it is advantageous to prepare for the local treatment by the use of iron, or to employ it at the same time. In such cases, where, at the same time with a convulsive cough, there is a fixed pain, usually on the lateral region of the larynx, the constant electric current is manifestly efficacious.

The pains that may arise in the localities above mentioned,

without nervous cough, may occur persistently, or only from time to time, and should not be regarded as anything less than important and harassing symptoms. Patients refer to the points corresponding to the entrance of the laryngeus, and think that the physician must accordingly find a morbid, inflamed spot, under laryngoscopic examination. These localized nervous pains, in spite of all derivatives, are only suppressed by the application of the constant current of electricity, often in a short time, but sometimes after its continuous and energetic employment.

Repeated sub-cutaneous injections of morphine in certain cases have had a permanently good effect.

[In cases of nervous cough dependent on anæmia, I have seen most excellent results from the careful employment of *general electrization*, with the Faradaic current, using the hand as an electrode according to the method described in the Introduction.

Immediate and pleasing results may often be secured by partial electrization alone, but in order to permanently remove the anæmic condition, of which the irritation in the throat is but a symptom, it is best to avail ourselves of constitutional tonic effects, that can only be obtained by making the applications over the entire surface of the body. General electrization, when employed with care and *perseverance*, and with a studious and practised regard to the temperament of the individual, soon makes itself felt by increase of appetite and strength, by a healthier performance of the various functions of life, and consequently by an improvement in the quantity and quality of the blood. It thus meets the chief indications for which we use iron, quinine, and nux vomica, and may very properly be used in connection with the internal administration of these, or of any other tonic remedies.]

DISEASES OF THE NERVES OF MOTION.

Spasmus Glottidis.

Laryngismus stridulus (Hugh Ley), *Laryngitis stridulosa*, *Asthma periodicum acutum* (*Asthma* Milliari, Millar's *Pseudocroup*), *Asthma thymicum* (*Asthma* Koppii), *Asthma thymico-*

cyanoticum (Kornmaul), *Asthma spasmodicum s. laryngeum infantum* (Wichmann), *Apnæa infantum* (*Ausbleiben der Kinder*) Rösch, *Crowing disease*, *Croup-like inspiration* of the English; *Gallicinio* of the Italians; *Juchkrampf*, *Hühnerweh*; *Angina stridulosa* (Bretonneau), *Asthma infantile* (Boerhawe, Fr. Hoffmann), *Catalepsis pulmonum* (Hufeland), *Phreno-Glottismus* (Bouchut).

Never has terminology caused greater confusion than in the department of spastic motor affections of the larynx. A glance at the above nomenclature is sufficient to convince us that the majority of authors have named the disease from a predominating symptom.

Here, also, the laryngeal mirror has contributed very much towards making clear disputed and doubtful points. It has established that, with the observed functional disturbances, and pathological changes of tissue in the larynx, and, indeed, with absolute integrity of the parts, spastic symptoms of the vocal cords may be excited through contraction of the musc. arytenoidei proprii (transverse and oblique,) and the musc. thyro-arytenoidei. This symptom may also occur as a pure *hyperkinesis*, as a spontaneous disease of the vagus, or recurrent, or it may result from irritation of the former, though reflex action from other nerve branches.

We exclude from consideration the spasmodic symptoms that occur in the course of acute or chronic inflammations of the larynx, as well as the symptoms that depend on a paretic condition of the muscles of the glottis, and only simulate the image of a laryngo-spasm.

In the way of pathological anatomy, we are also unable to find any precise data by which laryngo-spasm may be characterized. In many cases the post-mortem section shows a normal appearance. In other cases the causes that are adduced as genetic by many authors, and which are considered in the chapter on etiology, are to be received at all events only problematically and not with absolute certainty, because such kind of pathological changes are very frequently observed without there being manifested any symptoms of laryngo-spasm.

SYMPTOMS AND COURSE.

Spasm of the glottis is a disease peculiar to early life, but adults, especially hysterical women, are not entirely exempt from it.

The spasm can occur in a mild form, with or without any warning symptoms of difficult breathing and anxious expression of countenance, as well as by the severest paroxysms, threatening suffocation.

Sometimes, also, in the mild forms, a partial, and in the severer forms a complete, closure of the glottis occurs, with suspension of the respiratory movements.

A mild form, which usually attacks children in the night, and adults in the day, manifests itself through difficulty of respiration, of brief duration, accompanied with a piping sound on inspiration. The child moves its arms restlessly, and its face has a most anxious expression; but after a few minutes, without any marked disturbances, it falls to sleep again, breathing quietly.

A severer form of attack is characterized by a crowing, irritating, or piping act of inspiration, violently repeated, many times in rapid twitches. The glottis then becomes more and more closed, with difficulty admitting even a little air, until all respiratory movement is suspended. The face is pale and livid, the lips blue, the eyes projecting and widely opened, and the veins of the throat swollen. Cold sweat starts out on the forehead, and the pulse is small and intermittent.

After a few minutes the spasm subsides, and breathing is again established, with crowing, or twitching expiration.

After such a tormenting process, which very naturally throws the bystanders into the greatest state of alarm, the children at first have a terrified, anxious expression of countenance, and then become exhausted, fall into a deep sleep, and wake up entirely well.

The intermissions between the separate attacks are of various duration.

In advanced stages of the disease, they may occur in quite short intervals; they are sometimes even repeated forty and fifty times a day.

In a disease that increases in intensity in such a manner, the spasm is not limited to the motor fibres of the vagus alone, but tonic and clonic convulsions also appear in other nerve tracts. This has been designated by some authors as the second, or convulsive stage of the disease. The muscles are stiff, the spinal column is curved, the thumbs are turned in, the hands, together with the wrists, turn themselves inwards, the feet turn inward and their soles outward, the eyes roll up, the tongue hangs out of the mouth, and involuntary drooling ensues. The pulse is intermittent, the extremities cold, and complete apnœa results that lasts for several seconds.

If with these symptoms the case goes on more favorably, the child makes here some wheezing inspirations rapidly succeeding each other, followed by crowing convulsive expiration, until the respiratory movements resume their normal condition.

If death occurs in the convulsive stage, the muscles are relaxed, the everted wrists extend themselves, and the respiratory movement is suspended.

The disease may have either an acute or a chronic course. Usually the mild stage continues from eight days to several weeks or months, and does not extend into the second stage.

The disease may close with a single attack, or spasms may occur several days after, and then may be entirely suspended, to be repeated again after a week.

But, as has already been mentioned, a number of relapses may be observed in the course of a day.

The convulsive stage lasts fourteen days, for the extreme, and frequently ends with death.

If the course of the disease be chronic and tend towards recovery, these attacks will always be milder and less frequent, until they entirely disappear.

Death may also result through general decline of the strength, especially in weak constitutions.

In adults the attacks are usually milder, but their course is very apt to be chronic. The milder cases advance rather with the symptoms of a hard, protracted, stridulous inspiration, and with a shrill sound in inspiration. In the weaker forms there is a feeling of constriction in the throat, and tormenting dyspnoea, causing the eyes to project, with a stiff and staring look. The patients with convulsive haste cling to the object nearest at hand.

In women and girls we see such attacks not unfrequently pass into hysterical convulsive paroxysms.

ETIOLOGY.

It is an established fact that spasms of the larynx occur more rarely in adults than in children. It is most common at the period of dentition. Children are less frequently attacked after the second year; boys more often than girls.

In adults the reverse is the case, women being more liable than men.

Bad nutrition, impure air, and the damp months of winter especially favor the existence of this disease, and particularly in those already affected with scrofulous or rachitic dyscrasia. According to Romberg, there is without a doubt hereditary predisposition to this disease, since all the children of a family are often attacked by it.

With regard to the exciting causes, it is worthy of mention, that psychical affections, as terror, passion, anger, may give rise to an attack.

Among the pathologico-anatomical changes which may possibly give rise to the disease, we may refer chiefly to the direct pressure on the recurrent nerve, caused by hyperplasia of the thymus gland. Köpp would find in this the exclusive organic cause of the spasms; later reliable observers, however, have published so many cases of this disease with careful post-mortems, in which, on the one hand, no pathological changes were found in the thymus gland, or where, on the other hand, with actual disease of this part, the patients were manifestly inclined to hydrocephalus, that at all events we are

justified in not regarding the thymus gland as the exclusive and constant seat of this affection.

Still less should we adopt the theory advanced by the English physicians, that the compression of the recurrent nerve through hypertrophy and degeneration of the glands of the throat and bronchi, is the direct cause of spasm of the larynx. In the history of this disease, moreover, yet other symptoms are mentioned, especially symptoms of narrowing of the larynx, hoarseness, and so forth, in the intervals, so that very probably another local disease of the larynx may be accepted as the cause of the spasm. But, at least, we are not justified, without laryngoscopic evidence, in regarding such symptoms as these as proofs of the direct injury of the conducting power of the recurrent. According to Elsässer, among the affections that are very apt to precede an attack of spasm of the larynx, is softening of the base of the brain (craniotabes.)

The affection, through its effects on the central nervous system, appears to act most powerfully as the *causa proxima*.

According to the statistical researches of Lederers, of ninety-six children affected with spasm of the larynx, ninety-two were also victims of hydrocephalus.

Some authors, as Gölis, John Clarke, M. Hall, Corrigan, seek for the cause of spasm of the glottis in a hyperæmic condition of the brain and spinal cord, as in chronic hydrocephalus internus, in cerebral hyperæmia, irritation of the medulla oblongata, or of the cervical portion of the spinal cord. All these appearances, however, are often clinically observed in childbirth, and there may also be anatomical evidence of extensive hyperæmia of the membranes of the brain and of serous collections in the ventricles, without there being any trace of spastic symptoms.

On the other hand, where spasm of the glottis has existed, and when the appearance above described has been afterwards demonstrated, the latter may be regarded merely as the result of the disturbance in the circulation caused by the spasm.

Finally, we have yet to mention, what is, perhaps, the best-

grounded cause of spasm of the glottis, namely, the reflex symptoms of the vagus, dependent on a sensitive irritation of the other nerve tracts.

It is a fact of general experience, that children are most frequently inclined to reflex convulsions at the period of dentition, while, after the teeth break through, the spastic attacks rarely manifest themselves to any extent.

In the same way, the irritating conditions caused by worms or by gastric and intestinal catarrh, give rise to spasm of the larynx by reflex irritation.

Under the same head may also be enumerated other causes that operate injuriously, such as the sudden disappearance of exanthemata (Romberg), or the sudden stoppage of the perspiration following exposure to a draught of air, or from catching cold.

In adults, hysteria is the most frequent cause of spasm of the larynx.

The so-called *suffocatio uterina*, occurs either alone or in connection with other forms of convulsions attacking various parts of the body.

There are hysterical women who, on the first application of a powerful electric current, are attacked with spasms of the glottis and subsequently by spasmodic fits of weeping.

The spastic constriction of the glottis that occurs in epilepsy and hydrophobia, is a familiar symptom. Organic changes of tissue, ulcers and aneurisms, may also cause fatal spasms through pressure on the vagus and recurrent.

According to all this we are justified in considering the above-described appearances on post-mortem of a case that has died in a convulsion of the glottis, as causes that favor the disease, only when laryngoscopic examination made on the living, so far as the age of the child allowed, has enabled us to exclude with certainty every affection of the laryngeal tissue.

Finally, it cannot be denied, that in many cases, in the absence of every other assignable cause, there may be a disposition to spasm of the glottis through congenital irritability of the nervous system.

DIAGNOSIS.

If it be in any way possible, the laryngeal mirror must be employed after an attack of spasm of the glottis, for the purpose of ascertaining the condition of the larynx.

The opportunity of making an examination of this kind is more frequently presented in adults than in children, since the latter are attacked by this disease in the first months or years of life, when the application of the laryngeal mirror is simply an impossibility. In quite young children, the history of the case and the characteristic symptoms of the spasm—the attacks coming on suddenly, without any precursory laryngeal affection—are the principal guides in the diagnosis. A distinction between croup and pseudo-croup (although in this latter, spasms of the glottis, excited by reflex action, may occur) is not so difficult, when one considers that croup runs into febrile symptoms and into characteristic spasms of coughing, resulting from inflammatory processes of the mucous membrane of the larynx.

Moreover, the intervals between the different attacks of spasm of the glottis are free from all local or general symptoms of disease.

It is barely possible to confound it with *tussis convulsiva*, since this is characterized by choking and coughing connected with the paroxysm.

PROGNOSIS.

The prognosis depends on the age, the constitution of the patient, the cause, the duration, the stage, the grade of the disease and the complications. Young children are usually the most endangered, and the weakly more than the strong.

Spasms caused by cerebral symptoms, give an unfavorable prognosis, and all the more if convulsive symptoms appear.

The more frequently and intensely the attacks follow upon each other, the less is the prospect of recovery. The acute form is more dangerous than the chronic. When hydrocephalus supervenes, the result is always fatal.

In adults, who, as a rule, are attacked with spasm of the larynx more rarely, the danger of choking is less, inasmuch as with them the glottis, on account of its greater dimension, cannot become entirely closed.

The spasms of the glottis caused by hysteria, are not as imminently dangerous.

It is peculiar, however, that this class of patients, even after mild visitations of this disease, are annoyed by a perpetual fear lest they may remain in one of these attacks.

Some authors have observed fatal results in hysterical spasms.

Incurable changes of the tissue, that is, aneurisms and ulcers which press upon the vagus or recurrent, or grow upon it, and so cause spasms of the glottis, offer an unfavorable prognosis.

THERAPEUTICS.

The first indication to be fulfilled is to combat the attacks of spasm of the larynx, and in the next place to prevent their repetition, by treating, in a rational manner, the original disease, together with its complications.

During an attack we place the child in an upright position, sprinkle water in the face, admit pure fresh air, strike with the hand on the back, rub the extremities with flannel, or put sinapisms on the breast and calves of the legs, and apply quieting lavements, especially with infus. chamomile or valerian.

Sometimes the excitation of choking through irritation of the soft palate and pharynx by means of the finger relieves the spasm. Inhalations of ether or chloroform are also highly spoken of by many authors. But they must be used on children with great caution.

Among the internal medicaments, the following have the best reputation,—musk in large doses, from 2 to 4 grs. every 2 hours, and the aq. anti-hysterica foetida (Romberg) with Syrupus simplex, one teaspoonful of each every two or three hours, has attained the greatest reputation.

In regard to the prophylaxis, which is not less important than the therapeutics, we have first of all to prevent the re-

currence of the attacks by improving the diet and avoiding all injurious causes. All psychical excitation, terror, anger, sudden waking out of sleep, irritation of the air-passages, through faulty swallowing in drinking hastily, also punishment that tends to frighten children, should be zealously avoided. The sucking child may be allowed to remain at the mother's breast, unless other diseased states demand a change.

If the child had been weaned shortly before the attack, restore it again to the mother's breast, or provide a good wet nurse. When this is not convenient, at least provide unadulterated milk from one and the same good cow, or asses' milk, either pure, or adulterated with one-third water, according to the age of the child.

In the next place, provide for good and healthy air, and for a residence in a sunny mountain region that is protected from the north-east winds, or on the sea-coast.

Taking cold must be sedulously avoided by appropriate warm clothing. The diet of older children should be stimulating and nourishing, but as easily digestible as possible.

Weakly, cachectic children we treat by means of tonics administering bark, or the syrup of the iodide of iron, from 2 to 5 grs. three times a day.

In our special therapeutics we have chiefly to direct our attention to the existing basis disease. Disordered digestion, intestinal catarrh, the irritation of worms and diarrhoea, demand corresponding remedies.

In difficult teething, we should derive from the brain by calomel, &c.

English physicians highly recommend scarification of the gums. Acute affections of the brain and spinal cord demand an energetic antiphlogistic treatment, as bloodletting, (to be employed in small children with great caution,) cold, calomel, chronic derivation from the head, by purulent vesicants and setons. Shower-baths are very warmly recommended by famous teachers.

In scrofula, in the swelling of the bronchial glands associated with it, as well as in rachitic softening of the bones, the already-mentioned iodide of iron, cod-liver oil and sul-

phur-baths, form the therapeutic apparatus, which with a corresponding hygienic regimen, usually promises good results.

Hypertrophy of the thymus gland indicates anti-scorfulous treatment. Externally, iodine and iodine and mercurial ointment are recommended. Some authorities claim to have diminished the thymus by repeated bloodletting, thus cutting off its nutrition.

Adults who are affected with spasms of the glottis have, above all, to observe an appropriate dietetic regimen as carefully as children. In an attack, the chief care must be to remove the garments that confine the body, in order that the respiration may be unimpeded. The contraction of the inspiratory muscles and the relaxing of the paroxysmally contracted muscles of the vocal cords, demands usually the external application of irritants to the skin, sinapisms on the breast and calves of the legs, sprinkling of the face with cold water, inhalations of chloroform and ammonia.

If the spasm of the glottis reaches an alarming stage, tracheotomy should be immediately resorted to in adults, not less than in children. The medical treatment of adults consists chiefly of narcotic and anti-spasmodic remedies, such as belladonna, opium, valerian, and assafœtida.

In women, even in maidens, I insist particularly on a careful exploration of the sexual organs. The uterus is quite frequently the seat of the disease, from which the various forms of convulsions are excited in other nerve tracts by reflex action.

Finally, I have to call attention to a method of cure which, according to my knowledge, has not hitherto been recommended or attempted. It consists in the use of the galvanic current which I have hitherto essayed with adults, and naturally only in those cases when every causal connection for the spasm of the glottis was wanting, whenever a so-called irritability of the nervous system had been established. The application of the current is both central and peripheric. So far as the results go, we can only say that they are very encouraging.

By way of example, I refer to a very striking case, in

which the patient, a strong maiden, 23 years of age, of a healthy family, without any uterine disease, and with a normal condition of the larynx, as was fully established by a laryngoscopic examination, was attacked regularly every night for a period of several months with severe spasms of the larynx, that in the course of time gradually increased in violence. Under the use of the galvanic current, the intensity of the attacks diminished after 8 days, and in the course of 4 weeks the evil was entirely removed. Up to the present time there has been no relapse, either in this or in similar cases that I have treated in the same way.

PARALYSIS OF THE MUSCLES OF THE GLOTTIS.

The disorders of the nerves of motion of the vocal cords are not always of a paralytic nature. The cause lies in the organic mechanical changes of the parts of the larynx. Among these changes are included ulcers, or ulcerative loss of substance on the vocal cords, or in their immediate neighborhood, sub-mucous thickening on the posterior wall of the larynx, hypertrophied swellings, infiltration or formation of cicatrices on the mucous membrane of the larynx, ulcerative processes on the arytenoid cartilages, especially on their processes, even ankylosis of the arytenoid cartilages and their processes, which in a purely mechanical way interfere with the juxtaposition of the arytenoid cartilages, and consequently with perfect approximations of the vocal cords. We therefore very properly make a distinction between the paralytic and the mechanical disturbances of motion, and in this connection we treat of the paralyses of the nerves and muscles of the larynx, only so far as they have reference to the movement of the vocal cords.

We regard the following points of anatomy and physiology as established.

Two nerve-stems, the *laryngeus, superior and recurrent*, composed of sensitive motor and sympathetic elements, derived from the vagus, the accessory and the sympathetic, go to the larynx on each side from above and beneath.

The *recurrent* is chiefly a motor nerve, and is of great importance for the mechanism of the respiration, since it supplies the posterior crico-arytenoid muscles that alone widen the vocal chink. But it also sends its fibres to almost all the muscles that dilate and close the glottis. The laryngeus superior is composed of sensitive and motor fibres like the accessory. But the greater portion of the fibres of the accessory are motor, while its anterior portion runs on as far as the ganglion of the vagus and over and beyond this to the pharyngeal and laryngeal nerves.

The *superior laryngeal* supplies the crico-thyroid muscles entirely, and sends a few fibres to the transverse arytenoid. (Luschka.) The superior laryngeal also sends small branches to the arytenoid and thyro-epiglottic muscles.

If, then, in accordance with the above, we attempt to describe the mechanism of tension and contraction of the glottis, we may in substance state the following :

Dilatation of the glottis occurs by means of the posterior crico-arytenoid muscle, through the innervation of the recurrent laryngeal nerve.

Contraction or closure occurs by means of the true arytenoid muscles, transverse and oblique, both internal surfaces of the arytenoid cartilages being approximated, through innervation from the recurrent laryngeal, and some filaments of the superior laryngeal. (Luschka.)

Tension and elongation of the vocal cords occur through the crico-thyroid muscle by means of the innervation of the superior laryngeus muscle.

Tension and shortening occurs through the lateral thyro-arytenoid muscles, the vocal processes and edges of the vocal cords being approximated by innervation of the recurrent laryngeal.

We should not overlook the fact, that in these phonetic processes we are always called upon to observe the combined

action of muscles and nerve, positions of the arytenoid cartilages and vocal cords, which may be ascribed to the action of individual muscles. The physiological action is not sufficiently demonstrated, to enable us to say, how far the alterations of certain muscular actions may be replaced and equalized by the power of others.

Before the introduction of laryngoscopy, only two kinds of paralysis were distinguished—paralysis with disturbance of respiration and aphonia (paralysis of the glottis), and paralysis with aphonia only (paralytic aphonia.)

It will now be our task, to use the words of Gerhardt, to recognize the consequences of paralysis of each individual laryngeal muscle; of each pair of muscles, of whole groups of muscles, not only on the voice, but also on the respiration; and furthermore, the consequences of the paralysis of one or both recurrenents of one or both superior laryngeal nerves; and finally, the results of paralysis of the fibres originally running in the vagus and accessorius.

Although this is a very extensive undertaking, and one not easily to be performed in all its points, yet we have come somewhat nearer its performance by certain facts and experiences; and the classification in vogue before the use of the laryngoscope cannot now be regarded as correct.

We have been able to make a complete diagnosis with the laryngoscope, and shall therefore make a classification on a clinical basis—such as is furnished by the laryngoscopic image—and speak of paralysis of the vocal cords as *constant* or *stabile*, as *phonic* and *incomplete*, since we are able to add to each individual form a physiological explanation, as far as the present data render it possible.

Through the laryngeal mirror we obtained a formal and complete diagnosis in detail, and we now speak of paralysis of the vocal cords as being *constant* or *stabile*, as *phonic* and *incomplete*.

In the constant paralysis of the vocal cords (complete immobility of the vocal cords), we have to distinguish between a total and partial paralysis of one side, as well as partial paralysis of both sides. The power of closing and opening is thrown into a

paralyzed condition, as the result of a disease of one recurrent. A complete paralysis of both recurrences has not been yet observed by the laryngoscope. An incomplete paralysis of the recurrent of one side makes a kind of falsetto voice, since the healthy vocal cord vibrates with a breast-tone, while the one which is paralyzed remains immovable in the median line, and, at most, allows its border to vibrate as a falsetto tone.

If the crico-arytenoid posterior muscle is paralyzed above, on both sides, an almost complete closure will result, through the preponderating contraction of its antagonists, so that in the respiratory stream of air a striking sound is observed, without there being complete aphonia.

The phonic paralysis is that in which the respiratory motor movement of the glottis is not entirely destroyed, but in which a faulty or (in spite of the attempts at phonation) only a momentary closure is observed; and where, on account of the disturbed innervation of the muscles of the larynx, the vibration of the vocal cords is entirely wanting, or unsatisfactory. The phonic paralysis presents five different forms.

Incomplete paralyses do not cause absolute aphonia. They are distinguished from the above-mentioned forms only through a deficient or sluggish movement of the vocal cords, since their excursion, as well the approximation of the arytenoid cartilages, is incomplete, and often very deficient.

The anatomico-pathological appearance in most cases affords us no explanation in regard to the existence of paralysis of the glottis. Only from the following stand-point can the cause be ascertained—where either the muscles of the larynx show either atrophy or fatty degeneration; where a general disease of the larynx, that causes the paralysis, is found—such as tuberculosis, with its train of symptoms; or where, in remote parts, the vagus (that is, its ascending branch) is so injured by aneurisms, benign or malignant tumors, degeneration of the glands, or inflammatory products, that by pressure and stretching, entire compression, adhesion and atrophy result.

SYMPTOMS AND COURSE.

In most of the diseases of the larynx, the symptoms give but an uncertain basis for a diagnosis. But this is especially the case in paralysis of the glottis, for the hoarseness and aphonia, of a more or less declared degree of severity, are found in all inflammations of the larynx. Moreover, the changes of the voice do not always extend to a complete aphonia. The power of emitting sound depends entirely on the extent to which the muscles, or entire group of muscles concerned, are attacked. The tone may be deep and monotonous, if only those muscles are affected on which the tension and shortening of the vocal cords depend. On the other hand, in a paralysis of one side, as already indicated, a permanent falsetto tone may exist, since one vocal cord is attacked in a state of relaxation, the other in a normal degree of tension.

Coughing and regurgitation in swallowing can appear only in those cases where the deficient closing of the vocal cords is combined with an impaired mobility of the epiglottis, or with an inflammatory affection of the mucous membrane in general, so that the particles of food will be disposed to force their way into the air-passage.

In a partial paralysis of both sides, no abnormal sound is perceptible in quiet respiration. So soon, however, as the respiration is accelerated, through any other cause, there arises through the strong inspiratory stream of air, a loose vibration of the vocal cords, a sound resembling snoring, or protracted asthmatic inspiration. At the same time, there are more or less declared symptoms of oppression and difficult breathing. However, even such a high grade of dyspnoea as may be caused by mental affections, and by excessive straining of the body, occur in the same way, when the cavity of the larynx is filled with prominent swellings, or with new formations of any kind. We see, therefore, that all these symptoms are simply *a priori* indications, and only find a thorough and exhaustive explanation, after a local examination has been instituted.

Hysterical aphonia is an affection entirely isolated from

the forms of disease above mentioned, since it suddenly appears and disappears, without any psychical impression. But it can be of longer duration. In many cases, the aphonia appears periodically, and may therefore be appropriately designated as aphonia intermittens. I have recently dismissed a patient as cured, who, for seven years long, had a voice entirely clear and strong, from the hour of waking until ten o'clock in the forenoon, regularly; and then, without any cause—or sometimes even before that hour, with any exciting cause, even trifling physical exertion, or mental emotion, the voice was lost for the whole day.

ETIOLOGY.

Paralysis of the vocal cords may be caused by local (primary) diseases of the larynx, by disturbances of the nutrition of the vagus, or of its branches, by constitutional nervous diseases, by blood diseases, by intoxication, and affections of the nervous centres.

In the rarest cases, the paralysis of the muscles of the glottis, have a central origin, as extravasation, tumors, or softening of the brain. It is not yet fully established what part of the brain must be affected with pathological processes, in order to cause an alteration of the vocal function of the larynx.

In the majority of cases, only disturbance of speech, and not of voice, will be excited. Examples of this have been collected by Andral, Marcè, Friederich and Lebert.

The same is true of diseases of the spinal cord. Even in fractures and luxations of the cervical vertebra, no changes of the voice can be ascertained. A case of aneurism of the basilar artery, reported by Romberg, resulted in aphonia. Among the toxic paralyzes of the vocal cords, we recognize, by the aid of the laryngoscope, the saturnine (lead) as well as the arsenical. Among the blood diseases, we have observed paralysis occur after anemia, typhus, diphtheria, and acute rheumatism.

Among the constitutional diseases, hysteria is the most frequent cause of aphonia. This may be a purely mental

effect, independent of symptoms of disease that otherwise cause disturbances of the vocal function. But in the majority of cases, there is a special disease that lies at the basis. An affection of the uterus may be the source whence—together with disturbances of another character, in the organism—the larynx is also sympathetically affected. Therefore, we should never neglect, so soon as any changes of the voice or complete aphonia are experienced in women, in the first place, to make a thorough exploration of the genitals, in order thereby to treat the symptomatic disease.

In the greater number of cases of aphonic paralysis that I have observed in women and maidens, this point cannot enough be insisted on. Even in quite young girls, who present hardly any marked symptoms of uterine disease, there are in this system anomalies on which the paralysis depends, and on the removal of which, the aphonia, without regard to the laryngeal affection, permanently disappears, after a shorter or longer time.

The *impairment of the conducting power of the vagus* is brought about more particularly by compressing tumors, such as carcinomata, aneurisms of the aorta, of the innominate and sub-clavian, probably also by spontaneous inflammation, or softening processes on the vagus.

Without doubt, also, the bronchial glands, with which it is in contact internally, may cause impairment of the conducting power through degeneration and chronic swelling.

It is repeatedly observed that the nerve appears as strongly compressed, is even much flattened and atrophied, and even presents degenerated masses of glands, internally adherent. The upper branch of the superior laryngeal is more rarely injured. On the other hand, the recurrent, on account of its anatomical position, is much more frequently the seat of various forms of disease.

It can also become altered through pathological changes of the aorta, the subclavian artery, the œsophagus, the trachea, the apices of the lungs, and the lymph glands surrounding them.

Sometimes, also, carcinoma of the œsophagus may extend to the recurrent, and cause paralysis of the glottis.

Paralyses of the glottis are brought about by direct rheumatic affections and through taking cold, more frequently than through the previously-mentioned causes.

When this does occur it is probable that the numerous fine ramifications of the nerves of the mucous membrane are the mediums by which the larger nerve branches become deranged in their nutrition. Cases not unfrequently occur where patients, after a warm bath, being suddenly exposed to a draught of air or cold, lose their voice. I have had opportunity to observe such cases in quite healthy and robust men. The laryngoscopic diagnosis revealed the most typical cases of total, usually one-sided paralysis of the vocal cord. Still further, acute or chronic inflammations of the mucous membrane of the trachea and of the submucous tissue, are among the most frequent causes of paralysis.

But the most frequent of all causes are catarrhal rheumatic affections of the nose, throat, and mucous membrane of the larynx and probably also serous saturation of the muscle of the vocal cord.

An evidence of this is the fact that such paralyses are not cured through the electric current, but only through the local application of astringents.

Injurious causes that operate in a mechanical manner, even though they be merely transient, may also cause aphonic paralysis of the muscles of the glottis. We recall in this connection cases of partial or total aphonia which were produced by excessive exertion of the organs of speech, especially through continuous and loud crying.

LARYNGOSCOPIC DIAGNOSIS.

The constant (stabile) paralysis of the closer of the glottis may be partial on both sides, and total and also partial on one side.

In the first place, we observe that while the character of

the respiration is quite unchanged, the *rima glottidis* opens very moderately or scarcely at all. The vocal cord has neither a disposition to make any excursion nor to bring the inner surfaces in contact when phonation is attempted.

A vibration of the vocal cord sufficient to cause the emission of sound is not perceptible. The most that can be seen is that the surfaces of the vocal cords following the inspiratory stream of air, incline downward, and in respiration more upward, and thereby separate a little from each other.

The symptoms of dyspnoea, and so forth, below described, are accounted for by this appearance.

In constant paralysis of one side, the arytenoid cartilages, together with the vocal cord, are seen to be immovable, and the border of the latter more or less approximates the median line. The paralysed vocal cord shows little or no tension. On the other hand, the other healthy arytenoid cartilage makes the excursion alone, outwards and back again, sometimes even over the median line beyond the other cord. On this account the paralysed vocal cord usually appears shortened, but in exceptional cases is seen to be lengthened, and the cartilage lower and somewhat more inclined outwards.

We must not be deceived in examining difficult cases, if on deep inspiration, also in extension outwards of the healthy arytenoid cartilage, the one which is paralysed also exhibits some sign of movement.

We sometimes observe cases in which, with entire closure of the glottis and with undisturbed excursive capability of the arytenoid cartilages, one tubercle of Santorini stands higher than the other, or they cross each other, one standing behind the other. This appearance should not be confounded with a paralytic form, as much as may be the resemblance in the closure of the glottis. A repeated inspiration and expiration will very soon distinguish actual paralysis from anomalies in shape.

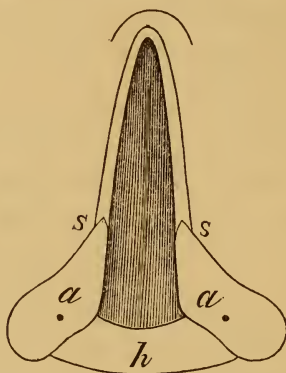
In *phonic paralysis* of the muscles of the glottis, we remark in general, that during the attempt at making a sound, there is a more or less prominent opening of the whole *rima glottidis*, and an imperfect or only a very narrow vibration

of the vocal cords. There is a peculiar symptom in this form of paralysis, in that the same muscles which appear paralyzed in phonation, *e. g.*, in coughing, swallowing, compression, allow the perfect closure of the glottis.

We distinguish five forms of this kind of paralysis.

1. Complete opening of the chink of the glottis—the

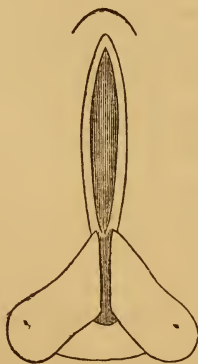
FIG. 18.



ligamentous as well as the cartilaginous portion—image of acute-angled triangle. (Fig. 18.)

2. *Opening of the ligamentous portion, with closure of the*

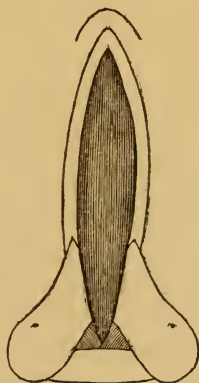
FIG. 19.



arytenoid cartilages, and paresis of the internal muscles of the vocal cords. (Fig. 19.)

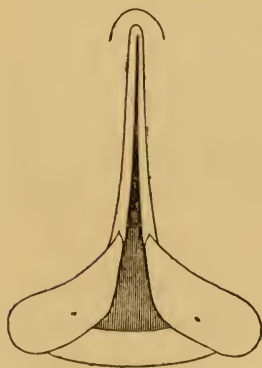
3. Elliptical opening of the ligamentous portion, with incomplete closure of the arytenoid cartilages, paresis of the crico-arytenoid lateral muscles and of the thyro-arytenoid. (Fig. 20.)

FIG. 20.



4. Closure of the greater portion of the pars ligamentosa,

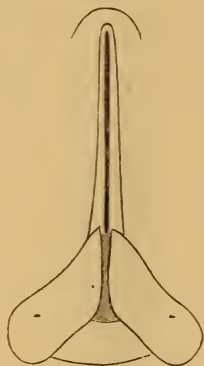
FIG. 21.



with opening of the arytenoid cartilages, chiefly the musc. arytaenoideus trans. (Fig. 21.)

5. *Normal closure* of the glottis, but *imperfect vibration* of both vocal cords, or of one or the other. (Fig. 22.)

FIG. 22.



The first form sometimes presents a closure of the glottis at the moment of attempted phonation, but there is a want of endurance to the innervation, and both sides quickly move apart from each other and remain in the position above described.

In the form represented in figures 18 and 20, aphonia is always present, sometimes also in that represented in figure 21, since in the formation of a tone there must be, at least, an appreciable contact of the tips of the vocal processes. In figure 19, the formation of the voice depends on the fact of the presence or absence of the vibration of the vocal cords.

Even in quite marked elliptical opening of the *pars ligamentosa*, there may be a voice, if the arytenoid cartilages lie against each other.

The laryngoscopic image that the so-called hysterical aphonia presents does not differ from that of the phonic forms of paralysis. The vibration of the vocal cords even, may be seen to be wanting. In the free intervals, examination may reveal complete normal form and condition of mobility of the vocal cords and arytenoid cartilages.

The incomplete paralyses present a diminished, less exact power of excursion of the arytenoid cartilages, and a very

sluggish movement of the same in phonation. Corresponding to this is a weak, that is easily fatigued voice. It is impossible to make certain tones, but there is never aphonia.

This condition may be designated atony of the muscles of the glottis.

PROGNOSIS.

In paralyses that depend on diseases of the brain and spinal cord, the prognosis is absolutely bad.

The prospects are also unfavorable in aneurisms, in carcinoma, and all such fundamental diseases which cause a disturbance of nutrition of the vagus and its branches.

When the paralysis of the glottis depends on a scrofulous disease, with prominent swelling of the lymph glands, then a corresponding internal medication and a hygienic regimen, especially with children, will not be fruitless.

The prognosis is most favorable in those cases where a paralysis occurs as a result of inflammation of the mucous membrane of the larynx, or of rheumatism. The prospects are equally good in paralyses that are caused by diseases of the uterus, or by psychical emotions.

The therapeutics will be inefficacious, chiefly in those cases where the paralysis of the glottis depends on incurable changes of the nervous centres, or on irremovable tumors that depend on previous anatomical changes of tissue, and interfere with the nutrition of the peripheric nerve system. For the swellings of the bronchial glands, or a scrofulous or tubercular basis, alluded to under etiology, we administer preparations of iodine, or in children the well-tried and approved cod-liver oil.

The irritation of the skin by moxas, vesicants, croton oil, and the endemic use of strychnine, previously recommended for rheumatic paralyses of the glottis, can be properly laid aside, since we have at our command a more efficacious method of cure.

Where the paralysis is the result of a chronic inflammation of the mucous membrane, the local employment of solu-

tions of nitrate of silver by means of the caustic sponge will bring the surest relief.

In diminished excitability of the peripheric nerves, which is always the cause, except in the cases above-named, the induced electric current, and still more the constant current, is recommended as the most reliable means of cure.

We can conduct the current on the posterior part of the cavity of the larynx, under the guidance of the laryngeal mirror, by means of a curved wire, isolated with gutta-percha, with an olive-shaped extremity (Duchenne), while the other moist electrode is placed between the thymus and cricoid cartilage.

The laryngeal galvanizer constructed for this purpose by Mackenzie is, however, to be preferred, since it renders possible a quick interruption of the stream.

This direct method of application has this disadvantage—that in spite of skilful and practised introduction, it will not be endured by many patients, or at most only for a very short time. I prefer, therefore, to employ the electric stream externally. My method of procedure is to place one electrode upon the cervical vertebra, or upon the larynx between the thyroid and cricoid cartilage, the other over the inferior laryngeal nerve, in the groove between the œsophagus and the trachea. This method answers for most cases, and the direct applications may be reserved for those which are obstinate. In many cases, especially in hysterical aphonia, electro-cutaneous irritation (electric moxa), is of excellent service. To accomplish this we place the moist electrode on the nape of the neck and follow the dry electrode—the olive-shaped extremity—on the skin in the neighborhood of the larynx.

[This experience of Tobold corresponds with my own, as has been already detailed in the Introduction.]

Although I have frequently demonstrated the good results of the use of the induced stream in many cases of paralysis—phonic as well as constant—yet, I cannot deny that its working is sometimes very protracted or utterly inefficacious.

I have, therefore, for a longer time used the constant stream in the various forms of paralysis of the glottis, and can truly

say that its effect, especially in phonic paralysis, is often speedy, and that it often produces comparatively quick results, where the induced stream is unsatisfactory or negative.

[That the constant stream will sometimes produce contractions in paralyzed muscle, even when the induced utterly fails, may now be regarded as an accepted fact in electro-therapeutics. It is for this reason, as well as for its greater intensity, and consequently greater power of overcoming resistance, that it is more efficacious in some forms of paralysis of the vocal cords. Both of these peculiarities of the constant galvanic stream—its ability to produce muscular contractions when the induced current fails, and its superior penetrative power—I have repeatedly demonstrated. A very interesting case of facial paralysis following exposure to a draught of air, has recently come under my observation. Although the most powerful Faradaic current from Kidder's electro-magnetic current at first caused no contractions on the affected side, yet a very mild galvanic stream at once brought most of the muscles to a contraction, and ultimately wrought a cure.

Similar experience has been recorded by other observers. Of some of the different forms of apparatus for generating the galvanic stream, I shall speak in the Appendix.]

For the hysterical paralyses that do not depend on uterine disease, the constant stream may well be recommended or employed on the periphery, and centrally, whether it affects the nerve-centers either directly or psychically, by reflex action.

In all these local medications, the laryngoscope will in every case give us the most certain control over the results.

Only in rare cases will a complete cure of paralysis result from a single application of the electric stream. Usually a longer time is demanded, and we observe, especially in constant paralysis, only a gradual progress in the movement.

In all the experiments which have been made, I will finally remark, I have seen no result from the sub-cutaneous injections of strychnine, lately recommended, just as I have been unable, by the way, by injections of morphia to attain a lessening of the sensitiveness of the laryngeal mucous membrane, sufficient to allow the performance of an operation.

I have, therefore, from the beginning of my laryngoscopic practice, given preference to the sponge over the pensil, and I can testify with certainty, that the majority of my patients are not attacked with the slightest irritative coughing, even at the first sitting. On the other hand, when the touching is more protracted, or is performed in a violent, unskilful manner, harassing cough, and even laryngospastic attacks, may be brought on.

[Dr. F. I. Knight, of Boston, has forwarded to me the details of a case that recently fell under his observation. Although somewhat unique in its character, it may very properly be inserted in this connection :

A gentleman from a neighboring State was transferred to me for examination and treatment, June 7, 1867, by Dr. Bowditch. He gave the following history :—About ten weeks previously, during an attack of acute articular rheumatism, while suffering from great pain in the *right* shoulder, he one morning became very hoarse, and in the afternoon of the same day aphonic, and had so remained up to the time I first saw him.

By laryngoscopic examination, I found that, on attempted phonation, the *right* vocal cord remained perfectly still, the vocal process being directed outwards ; but the mucous membrane covering the right arytenoid cartilage was pulled towards the median line, and in this way the cartilages of Santorini were approximated.

Now, it was not paralysis of the muscles closing the glottis, for here was the evidence of the powerful contraction of the posterior arytenoid. And if it had been spasm of muscles opening the glottis, there would probably have been some motion on attempt at phonation, and it could not have continued, as we shall see was the case. I therefore considered it a rheumatic affection of the crico-arytenoid articulation, causing ankylosis, and commenced to treat it accordingly. I applied electricity by means of Mackenzie's instrument, one pole over the right arytenoid inside, and the other over the right pneumogastric nerve. Internally I gave iodide of potassium. I also applied electricity to the muscles of the throat generally, to the left side as well as to the right. He came to see me nearly every

day. On the 22d, he was able to speak in a loud, hoarse voice. On examination the right cord was as immovable as ever, but on phonation the left passed the median line, and approximated the right, so that the current of expelled air caused vibration.

On the 26th, he was obliged, on account of business, to leave for home. He seemed too well satisfied with his hoarse voice, to stay longer for treatment. On the 12th July, he wrote me that his voice was the same. Since that time I have not heard from him. I was unable to confirm my diagnosis with the finger, that member not being long enough.]

SECTION VI.

ANOMALIES IN THE SHAPE OF THE LARYNX.

THE widening of the laryngeal cavity is the product of senile atrophy. Cartilage as well as soft parts suffer thereby a partial or total diminution of their tissues. This condition is without pathological importance. On the other hand, the contraction of the larynx is dependent on previously occurring diseases of another character, and on very important pathological processes.

Through benign or malignant tumors, both anteriorly, and posteriorly from the œsophagus, the larynx can suffer a greater or less pressure, and a consequent contraction of its inner space, as well as at the same time a lateral displacement.

Hypertrophy of the glands of the thyroid cartilage does not cause this symptom to such an extent as carcinoma attacking the deep tissues, especially if this takes its origin in the œsophagus, and then advances on the posterior side of the larynx.

The attacks of dyspnœa that are excited thereby in the majority of cases, especially through coincident compression of the recurrent, may be considerably increased.

In the cavity of the larynx there are various diseases and products of disease, such as swellings, hypertrophies of the mucous membrane and of the sub-mucous tissue, œdema, neoplasms of various kinds, contractions of cicatrices, and cicatricial hypertrophies, necrosis, caries, hyperostosis, erostosis, and ecchondroses, that produce changes of form, and often very considerable narrowing.

Hyperostosis, exostosis, and ecchondrosis, may be distinguished under laryngoscopic examinations according to the accessibility of the part which they occupy in the larynx,

as rugged, lumpy prominences; but the covering of the mucous membrane is not marked by any special color.

All these pathological conditions here mentioned, according to their situation and degree, may cause greater or less disturbances of the respiration, and even suffocation.

In the case of tumors on the surface exerting an influence on the larynx; if the internal or external use of iodine is without results, there remains only the extirpation of the tumor or the opening of the trachea in case it remains very accessible. In the morbid processes that occur internally, local applications of remedies, or direct operative procedures, under the guidance of the laryngeal mirror, may often produce brilliant results. This is especially the case with polypoid formations, that will be treated of in detail in a subsequent chapter.

Consecutive œdema occurring, for example, after syphilis, especially of the lower laryngeal space, which sometimes causes complete stenosis (closure) and renders tracheotomy necessary, I have recently attempted to treat by the introduction of catheter-shaped, elastic bougies, allowing them to remain in for some time. I cannot as yet give any definite judgment as to the result of this method. With the use of the laryngeal mirror, it is certainly a more appropriate procedure than formerly. I have learned this much, however, that the irritability of the larynx to catheterization may be diminished, in a comparatively short time, and I here can use a bougie as large as the No. 3 English rectal bougies, which, as is well known, are hollow, and thus may be made of the proper curvature by pushing in a large silver wire.

SECTION VII.

FOREIGN BODIES IN THE LARYNX.

FOREIGN bodies that accidentally fall from the mouth into the larynx, even when of considerable size, may remain on its upper aperture. If they are of smaller size they may stick fast in the Morgagnian ventricles, or may squeeze into the opening of the glottis, or may fall through into the trachea and bronchial tubes, possibly to be cast up again into the cavity of the larynx by the respiratory stream of air.

Among the very numerous cases that are recorded in literature, and that come under the observation of every teacher and practitioner, there are found the following substances:—beans, plum-stones, peas, buttons, fish-bones, grains of corn, needles, teeth, even artificial teeth, with gold fastenings or pieces of caoutchouc, articles of food, pieces of bone, necrosed fragments of the cartilage of the larynx of the nasal cavity, or of the vertebræ (in syphilis), worms, the contents of the stomach, blood and pus from abscesses. In this connection, also, we may speak of the incarceration of the epiglottis in the aperture, of which Middeldorf has published a case.

ANATOMICO-PATHOLOGICAL APPEARANCE.

According to the hard or soft quality of the foreign bodies, and according to the length of time they remain in any part of the larynx, the pathological character may progress from mild or acute hyperæmia of the mucous membrane to a chronic ulcerative process. Sharp and pointed substances, such as needles and fragments of bone, that readily penetrate deeply, are only loosened after abscesses have formed, and when they are expelled they leave behind a swelled and ulcerated spot on

the mucous membrane. Sometimes, important changes of structure may be produced, especially by wedge-shaped substances remaining for a long time in the Morgagnian ventricles.

If a foreign body that is hard and angular falls into the trachea and the bronchial tubes, it may cause bronchitis, pneumonia, and chronic ulcerative processes. It may also, though in rarely-observed cases, gradually perforate the tissue of the lungs, the pleura, even the wall of the thorax, and in this way emerge externally. Some authorities, on post-mortem examination of those who have died from other causes, have found, entirely by accident, pointed fragments of bone inclosed in the cavity of an abscess of the parenchyma of the lungs, without there having been any symptoms of such during the life of the patient.

On the other hand, quite small quantities of fluid give rise to important inflammatory processes, with fatal results.

Thus, I have lately seen a case where, after a carefully-performed tracheotomy, in an old man, a fatal result followed, from the entrance of a small quantity of blood into the smaller bronchí, on cutting through the cartilage upon the vessels of the tracheal mucous membrane, which were in a very hyperæmic condition.

SYMPTOMS AND COURSE.

Foreign bodies accidentally falling into the larynx, and remaining there only a short time, cause at first a severe paroxysm of coughing, with great sensitiveness of the mucous membrane.

The secondary symptoms depend on the size and nature of the foreign body, and on the part of the larynx in which it falls. It may cause an unpleasant, painful feeling, or difficult, irregular respiration. And they may also give rise to *paroxysms of coughing of greater or less violence, attacks of suffocation, and even death by suffocation may at once take place.*

If a hard body falls into the cavity of the larynx, a reaction ensues at the same time, with spastic symptoms of convulsive cough.

The face swells, and becomes red and livid, and the jugular veins grow turgid. The patient thrusts his fingers desperately into his throat, and in fortunate cases the foreign body flies out amid gurgling and strangling cough, and the danger is over. If the substance, however, remain in the cavity of the larynx, either squeezed in between the vocal cords, or in a certain degree wedged in at the entrance of the larynx, the patient may perish with the symptoms of asphyxia, partly through the mechanical closure of the cavity of the larynx, partly through the laryngospastic closure of the glottis, occurring through irritation of the vocal cords. The latter symptoms may be caused even by a small substance in the Morgagnian ventricle. In regard to the mechanical closure of the glottis, we may mention, by the way, that animals are often killed by suffocation, caused by swallowing a whole potato, "the wrong way," so that it closes the glottis like a spherical valve. Small quantities of fluid falling into the larynx (in mis-swallowing) cause only a reflex attack of coughing of greater or less violence, and thereby the contents are sometimes thrown out of the nose, and the familiar burning and tickling feeling in the nose remains. Larger quantities of fluid, however, such as pus from retro-pharyngeal abscesses that have bursted, the contents of the stomach in vomiting--if they fall into the larynx during sleep or in intoxication, may cause death immediately by suffocation. We include here those cases in which the foreign bodies fall through the larynx into the trachea and bronchial tubes, and are again cast out into the cavity of the larynx through the expiratory stream of air. In such a case, a fresh attack of suffocation may alternate with a shorter or longer period of rest, and even asphyxia may ensue.

The retention of a foreign body, in the deeper air-passages, depends much on the circumstances of the patient. I have recently known of a case where a coffee-berry fell into the cavity of the larynx of a boy five years old, in the act of laughing. The situation of the bean could be accurately diagnosticated in the right bronchus by auscultation. Some weeks later, as the patient was playing with other children,

suddenly he coughed violently, and the bean flew out, to the joyful surprise of his parents.

In regard to the local affections that foreign bodies cause by remaining in the larynx, or after expulsion, there may be, according to the length of time that their influence is felt, various grades of hyperæmia, of simple and ulcerous laryngitis, with their accompanying symptoms of hoarseness, pain, coughing, and so forth. If the foreign body remain in the bronchial tubes, it may, after a long time, and often not until after a year, develop further signs of pulmonary disease, with the symptoms of difficult respiration and of dry cough, and in this way the patient may terminate his life. In quite rare cases the foreign body becomes encysted, and remains in the lungs without doing injury.

When a sharp or pointed foreign body has irritated the cavity of the larynx, for an instant merely, and even when only the arytenoid cartilage has been touched, the pain in the larynx, especially on swallowing, may remain for a long time.

I recall the case of a maiden, who, four months previously, had swallowed a tooth and a piece of caoutchouc, with momentary symptoms of suffocation, and who, even then, persisted in imagining that there was a torturing oppression in the larynx. She believed that the piece of tooth was yet in the larynx, and on that account she repeatedly applied to me for a laryngoscopic examination.

[Cases similar to that which the author here records, are by no means uncommon. A young friend of mine—a lad of unusual good sense, as well as culture—who happened one time to swallow a fish bone, that irritated him somewhat on its passage into this œsophagus, for months afterward imagined that the bone was yet in his larynx. So thoroughly was he possessed with this idea, that he refused to take substantial food of any kind, and ate only enough to support life. He became a perfect hypochondriac, grew very thin and pale, and for a time his friends despaired of his life. He was taken away from his studies, and sent into the country, when, in a few months, the pleasures and amusements of out-door life

drove away his foolish imaginings, and eventually restored him to health and happiness.]

ETIOLOGY.

Foreign bodies can fall into the larynx in three ways, most frequently from the mouth, with the inspiratory stream of air, and through mis-swallowing, more rarely through perforation of the œsophagus, from the bronchial tubes and the trachea, through wounds penetrating the breast and throat.

Only light or smooth, rounded substances can be carried along by the inspired current of air.

The efficient cause of the entrance of a foreign body into the larynx, is generally the combined action of swallowing and inspiration—the so called “swallowing the wrong way.”

The normal act of swallowing is as follows :

The tongue presses itself gradually on the palate, from before backwards, and pushes the morsel upon it (the tongue) against the anterior palatine arch. When the morsel has passed through this, the palate lies close upon the roots of the tongue, and presses the piece to be swallowed through the posterior palatine arch further into the pharynx. Immediately after this act, the soft palate lies against the posterior pharyngeal wall, and thus closes the naso-pharyngeal cavity, while the epiglottis at the same time, by the action of the thyro and ary-epiglottic muscles, closes the aperture of the larynx, which has been elevated.

By contraction of the muscles of the upper part of the pharynx, the morsel is then pressed down further into the œsophagus. Such acts of swallowing are repeated, during the whole process of deglutition, uninterruptedly, one after the other. If, now, one speaks during this act, and at the same time, as is generally the case, inspires, the morsel, which is now upon the epiglottis, enters the laryngeal cavity, and then the “swallowing the wrong way,” or choking takes place.

Children and even adults have the habit of holding small substances, as buttons, needles, and so forth, in the mouth or between the lips, when suddenly, in opening the mouth, or in

yawning, the substance is conveyed over the tongue and into the widely-opened glottis, and thrown into the larynx, before it can be swallowed.

Cases also occur where foreign bodies, *e. g.*, large, firm morsels, remain in the pharynx and press upon the epiglottis like a valve, and in this way cause sudden asphyctic attacks.

We should also mention the so-called "swallowing the tongue" in the operation for extirpation or exsection of the lower jaw, because, after the division of the genio-hyoidei and genio-glossi, whose antagonists draw the tongue backwards, a valve-like closure of the opening of the glottis may be caused.

Experienced operators, therefore, never neglect to fasten a thread through the tongue, or to hold it by a fixation forceps.

DIAGNOSIS.

The subjective feeling of the patient is a not very defined or reliable symptom of the presence of a foreign body in the larynx, as the pain may exist for a long time after expulsion. On the other hand, a foreign body may remain firmly fixed, in the Morgagnian ventricle, for example, without there being any difficulty of breathing, and without there being at first any paroxysms of coughing. Only persistent paroxysms of suffocation allow the probable suspicion that a foreign body is closing the glottis to a greater or less extent. By means of the laryngeal mirror, we may elucidate all these points with absolute certainty.

If the foreign body is not in the larynx, and no expulsion has taken place, it may be either in the trachea or in the bronchial tubes. When the structure of the respiratory passage is favorable, it is sometimes possible to detect the foreign body by the laryngoscope even in the trachea. If the body is seen neither in the larynx nor in the trachea, we naturally infer that it lies still deeper, and then the question arises whether it be on the right or left side. Furthermore, auscultation will give a reliable explanation by informing us of the existence of an

uncertain or deficient vesicular breathing. Sometimes, also, the complaint of the patient of an oppressive pain in a certain part contributes to the establishing of a diagnosis.

Symptoms of pneumonia, or even of an abscess in the lungs, will be sufficiently recognized by the corresponding symptoms—fever, coughing, and expectoration.

Moreover, we should not omit to mention that foreign bodies remaining fixed at the opening of the œsophagus, by pressure on the larynx, can give rise to symptoms that may be mistaken for those that occur when they are in the latter. Here, also, the laryngeal mirror, first of all, will give us a positive answer in regard to the question of exploration of the œsophagus.

PROGNOSIS.

The prognosis is in general a difficult matter to decide, inasmuch as the asphyxia sometimes occurs very speedily, before it is possible to secure appropriate assistance.

But in other cases than these, laryngoscopy together with the possibility of an accurate diagnosis, has also secured greater certainty in the employment of proper restoratives.

Particularly is the size, form, and nature of the foreign body to be considered in our estimate of a case. Pointed substances are always hard to be extracted or expelled by the air. Soft, distensible bodies in the lower part of the trachea and bronchial tubes usually give a very bad prognosis, since they either squeeze fast or excite chronic inflammatory process in the lungs.

The continuance of a hard object in the depth of the air-passages is nothing less than a Damocletian sword to the patient, because such a body may at any time be thrown back into the cavity of the larynx, by the expiratory current of air, and then suddenly cause suffocation.

THERAPEUTICS.

So soon as impending suffocation causes us to suspect that a foreign body is in the larynx, the first absolute duty of the

physician is to make sure of the life of the patient by immediately resorting to tracheotomy.

But, in those cases where we recognize the foreign substances lying on the epiglottis, we may thrust the finger quickly into the throat and bring out the contents, or free the epiglottis by pushing it aside.

In the majority of cases the symptoms are not so violent and oppressive, but there will be time to ascertain, by a laryngoscopic examination, whether the foreign body yet remains in the larynx, and in what place, or whether it has already fallen through below, and caused the above-mentioned local painful symptoms.

If there be grounds for the suspicion that the foreign body is something swallowed, and is stuck fast in the upper part of the œsophagus, we may at the same time make use of the sound.

The method of administration of drugs to cause vomiting, recommended in former times, as well as the procedure suggested by Brodie, of bending down the head of the patient in order to drive out the foreign body by striking the back of the neck and breast, we cannot advise, so far forth, until all other methods have proved themselves to be useless. And then, also, must we recommend the precautionary measure of having the instruments for tracheotomy at hand, while employing these methods.

In expulsive vomiting, the foreign body can be wedged into the glottis, or in turning the patient, a closure of the glottis may be caused in the same way, resulting in sudden, perhaps fatal suffocation.

I should advise tracheotomy, as a prophylactic, also for those cases where it is proved that the foreign body is in the trachea or the bronchial tubes. It may escape immediately after the operation, or be seized by instruments, as has often occurred; on the other hand, if this does not occur, sudden suffocation is at least prevented.

If the expulsion of the foreign body does not follow directly, yet experience proves that this will occur sooner or later. Of course the wound should not be held open by an

ordinary canula, but by inserting a silver ring, or seizing it with an appropriate hook. At this stage the method of Brodie, mentioned above, may be resorted to without danger, and perhaps with success.

If the laryngoscope establishes the fact of the presence of a foreign body in the larynx, which in quite small children is impossible, but in adults is not difficult, unless *suffocative* paroxysms are present, the most appropriate procedure is to extract it with a forceps under the guidance of the laryngoscope. Here, also, tracheotomy can be first employed for difficult and hazardous cases. This will at the same time afford opportunity for examining with the mirror through the incision made in tracheotomy.

I use and recommend, for the extraction of foreign bodies, a forceps designed for crushing polypi; an instrument quite similar to the ordinary pharyngeal forceps, and with a more angular curve, corresponding to the position of the larynx.

If the foreign body has stuck fast in a bronchial tube, and chronic inflammatory and purulent process, with hectic symptoms, are thereby excited, only a constitutional tonic course of treatment can be of service.

If it happen that in the act of vomiting, or through the sudden bursting of a retro-pharyngeal abscess, large quantities of fluid pour forth into the larynx, and not being sufficiently expectorated, cause symptoms of asphyxia, then not only is tracheotomy indicated, but also, directly after it, the collection of fluid should be drawn off by means of a catheter introduced into the tracheal opening.

SECTION VIII.

NEOPLASMS IN THE LARYNX.

ALTHOUGH the laryngeal mirror has been proved to be an indispensable factor for the establishing of an accurate diagnosis in the forms of disease, hitherto treated of, it is yet of special value in the case of neoplasms in the larynx. Here it is that laryngoscopy has won its greatest triumphs.

In ante-laryngoscopic times we could, at best, only *suspect* the presence of a tumor in the larynx in perfectly typical cases of disease, by a considerable difficulty of respiration, or by periodic attacks of suffocation. It is manifest that a positive diagnosis could not be made, especially in those cases where such new formations caused only a moderate, though persistent hoarseness.

These cases at the present day are not only accessible to the most absolute diagnosis, but, by the aid of the laryngoscope, the therapeutics afford a fruitful field for a direct and successful procedure ; whereas in former times they were only objects for a system of treatment conducted on uncertain presumptions.

ANATOMICO-PATHOLOGICAL APPEARANCE.

In general, neoplasms of the larynx appear as tumors, partly with broad bases, partly as pedunculated, hanging in the cavity like polypi.

Both varieties can narrow the cavity of the larynx to a greater or less degree.

According to the frequency of their occurrence, we distinguish them as follows :

1. Tumors of the connective tissue (fibrous polypi).
2. Papillary tumors ; papillomata, condylomata.
3. Cellular tumors ; carcinoma (canceroid or encephaloid in epithelial or medullary form).
4. Cystic tumors (mucous polypi).
5. Fatty tumors, Lipomata.

1. Tumors of the fibrous or connective tissue (Fibroma), fibroid, fibrous polypi, (desmoid, chondroid, steatoma, schirrus of the old pathologists).

The fibroma, a tumor consisting of mature connective tissue, has usually a round, oval, bulbous, or lobulated form, a smooth, sometimes granulated covering, and a hard, almost cartilaginous consistence. The size generally varies between that of the head of a needle and a hazel-nut. But growths have been observed of the size of a walnut or a pigeon's egg.

The fibroma has usually a pedunculated insertion. There are those, however, that have a broad, semi-circular base, and then form a more diffuse reflection into the tissue of the mucous membrane.

They develop from a circumscribed hyperplasia of the tissue of the mucous membrane. The cells there enlarge, increase by division, and after the excretion of a basis substance, pass into new bundles, and add to these until the neoplastic mass is isolated, becomes elevated in the form of nodules, and, with its increasing growth, appears encapsuled by loose cellular tissue, from the surrounding connective tissue.

In the diffuse, demarcated varieties, the growth occurs, through continuous separation of the connective tissue cells, with formation of a new basis substance, or by deposition of new masses of tumor from the surrounding connective tissue.

The firm and rigid fibromata appear as a structure, consisting of thick bundles of fibres, and is then, on section, smooth, hard, *creaking*, of a grayish-white, or grayish-red color. We may often readily see the course of the fibres with the naked eye.

Occasionally, however, nodules are seen on the section, more or less surrounded by concentrated filaments of connective tissue.

The soft fibromata have a very relaxed, reticulated connective tissue filled with parenchymous fluid, which only sparingly escapes on cutting, but which causes a marked collapse of the tumor.

The fibromata are quite rich in blood, and have a thick net-work of capillary vessels, which pass over the periphery of the tumor in small arteries and venous vessels.

Under the microscope, the fibromata consist of normal connective tissue, which is more or less provided with cellular elements, and in its basis substance presents at one time a firm, felty, at another a loose, arrangement of bundles of fibres. Sometimes small masses of mucous or fatty tissue are mingled with the spongy tumors, so that there is a kind of transition into lipomatous formation.

2. *Papillary tumors, papillomata, condylomata.*

The papillary tumors belonging to the order of tumors of the tissue, consist of papillæ, either single or standing, grouped together, and have a warty, grape-like, cauliflower, mulberry, or cocks-comb-like form, and usually a grayish-white, seldom a reddish appearance.

Each papilla consists of a connective tissue trunk, in which one or more capillary vessels go up and down, (passing into the basement membrane,) (*mutterboden*,) as well as a coating of epithelium, which answers to the basement membrane, but is especially pavement epithelium, because, as is well known, only the vocal cords and a small stripe on the arytenoid cartilages have ciliated epithelium.

The papillæ develop themselves partly as spontaneous neoplasms through the growth of papillary bodies from the cervical processes of the basement membrane, partly from hypertrophy of the existing normal papillæ. The tumor may then consist of just as many enlarged papillæ as there are upon

the basement membrane. The body of a papillæ is of various lengths and sizes, now with single, and again with abundant ramifications.

If the latter be the case, each little branch has its own epithelial coating. The epithelial layer is sometimes thick, but occasionally very delicate also, so that the papillæ acquire either a smooth and rigid, or a velvety appearance.

In the simple structure of a papilloma, several papillæ spring out from the basement membrane, near each other, but, in the complex formation, the surface becomes elevated to a fibrous vascular trunk, which branches off like a tree, and has papillæ only on the branches.

Papillomata are of three varieties, simple (compact) berry-like, and villous.

The *simple* (compact) *papilloma* consists of pointed or knobby papillæ that are covered with a very fine pavement epithelium, so that the whole tumor appears as a smooth, firm mass (condyloma on the posterior wall of the larynx).

The *berry-like papilloma* consists of ramifying papillæ, which rise up from the trunk-like extension of the already mentioned basement membrane. On transverse section, such a tumor exhibits a conical, quite a vascular structure, proceeding from the basement membrane, which sends out peripheral branches and twigs, from which, again, papillæ proceed.

Such tumors have a polypus or fungus-like appearance, even resembling a lobulated mass.

The *villous papilloma* has long, soft, simple, or ramifying papillæ that are covered with a thin, velvety-appearing covering of epithelium.

Both varieties, the granular as well as the villous papillomata, occur more through neoplastic formation than by hypertrophy of normal papilla. In some cases a quite open expansion of the papilloma may occur, the vocal cords at the same time undergoing considerable degeneration.

Cellular tumors, carcinoma, epithelial form (cancroid), *medullary form* (encephaloid).

Both forms are observed in the larynx, the former more frequently than the latter.

In general the cellular tumors are characterized in this way, that they consist either of cells alone or are of a meshy framework of connective tissue, with vessels and inclosed cells.

The cancer cells, with regard to their size, form and disposition, have no specific type. They are round, oval, globular, smooth, angulated, spindle-shaped, with round, oval, smooth, or granulated nuclei, with one or more homogeneous and distinct nucleated bodies. The membrane is very delicate and transparent.

The simple cancerous cells have only one nucleus. But there are cells in the cancerous fluid, with two or more nuclei, which exist by separation.

The stroma consists of variously developed connective tissue, which is sometimes composed of loose and delicate, again of thick and straight fibrillæ, and again of closely lying together, fibrous filaments of fusiform cells. The alveolar arrangement of the stroma, forms a net-work of varying shape and size. Occasionally it is so narrow, that the interstices disappear, and the cancerous fluid lies without order between the fibres, or the connective tissue is so hard, that the carcinoma seems to consist only of cells.—(See *Encephaloid*.)

Quite large capillaries run in the tissue, while occasionally they form a very narrow net-work, and are connected to the general circulation by arteries and veins.

The cancerous fluid (or juice) is a turbid, albuminous, or mucus-looking mass, consisting of cancerous serum and corpuscles. On the section of a carcinomatous mass, we generally see a turbid, curdy mass, oozing out or emerging on pressure, a characteristic evidence of carcinoma, although not for all cases.

Carcinoma generally occurs as small nodules in the sub-mucous connective tissue, through proliferation of the connective tissue cells. The nodule is there demarcated by a connective tissue envelope, and grows from within outward, by the formation of new portions, since the stroma and fluid make up the growth regularly.

If the formation of fibrous elements predominates over

the development of cells, the tumor grows more slowly, and appears as a hard cancerous mass. If the nucleated and cellular formation predominate, the growth is more rapid, and the tumor appears as a soft medullary growth. In this form, on peripheral degeneration, the surface may ulcerate, and finally form a perfect carcinomatous ulcer.

The following varieties of carcinoma are observed in the larynx:

1. *Epithelial Cancer*, (Cancroid,) *Epithelial Cancroid* (Epithelioma).

This cancroid consists of a fibrous stroma, in which alveolar cells of small or large size, and consisting of laminated or cylinder epithelia, are imbedded, thereby giving a name to the type.

The cells on lying closely together, and in the absence of inter-cellular fluid, form acinose bodies, or collections in which the recent cells lie externally, the older within.

These acinose bodies are not developed from normal epithelium, but primarily in the connective tissue, from connective tissue cells, through endogenous cell formation, by separation of the cells and by bud-like outgrowths of the collections of cells. In the latter case they resemble racemose glands.

The cancroid growths also grow from new cancroid masses arising in the surrounding connective tissue. Thereby the basement membrane may undergo considerable destruction, especially when ulcerative processes also appear through superficial softening. In case of slow growth, the cells only increase in the interior, and the peripheral proliferation is wanting.

On the cut surface the mesh-work appears interspersed with whitish granules, as when crumbling cheese is cut, or small tallow-like drops may be squeezed out, or the surface is perfectly smooth, fibrous, or glandular, with more or less secretion of fluid.

2. *Medullary Cancer*, *Carcinoma Medullary* (Encephaloid).

This form of tumors tends specially to ulceration, and on account of their abundance of vessels, to hemorrhages.

The stroma is only slightly developed, and in the softest and most rapidly proliferating forms, consists of a rich capillary net-work, while the basis only contains a delicate alveolar connective tissue structure. The medullary fungus forms in the larynx a tumor, generally of a lobular, cauliflower appearance, of a soft lardaceous consistency, of a gray, more rarely reddish color; and, on the cerebral-like surface, quite an amount of curdy fluid exudes.

4. *Mucous Polypi* (encysted tumors filled with colloid-like fluid, gelatinous or colloid cysts).

The encysted tumors are formed as simple, small protrusions of mucous membrane, or as larger tumors of the size of two peas or a grape, through serous or colloid-like fluid.

Its walls consisted of normal, occasionally hypertrophied mucous membrane, while the contents formed a delicate fluid, colorless mucous, or gelatinous mass. The pathological process is a double one. The cysts are formed by the retention of the unaltered secretion, in the follicles of the glands secreting mucus, through closure or contraction of their canal of exit, or thickening of their walls. The collected secretion at the same time undergoes further changes, because the specific material of the secretion is reabsorbed, and, instead of it, serum or mucus is collected in the cyst.

5. *Fatty Tumors, Lipomata.*

The lipoma enters into the larynx from sub-mucous cellular tissue, and appears as a spherical, lobulated, or polypoid pedunculated tumor of various sizes, which is bordered from the peripheric surrounding parts by a sheath of connective tissue. Only in rare cases does it diffuse itself into the surrounding tissue. The structure consists of connective tissue, provided with a greater or less number of vessels, and inlaid with fatty cells.

The formation of lipoma occurs in such a manner that the connective tissue cells swell up by the increase in fat, and are changed into round, fat cells, filled with fat granules, which then run together to a large fat globule.

If the connective tissue be more developed than the fat cells, the tumor becomes more lardaceous, and according to *J. Müller* is called steatoma, according to Virchow lipoma fibrosum. If larger or smaller masses of mucus or gelatinous material are mingled with it, a transition to myxoma occurs.

The increased surface of the tumor appears of a yellowish or lardy color. The lipoma grows slowly, partly through increase of its elements and partly through deposition of connective tissue on the periphery.

SYMPTOMS AND COURSE.

All the symptoms that are caused by neoplasms depend on their size, their histological character, and the position that they occupy in the cavity of the larynx. Small polypi (if it be allowed us to employ this general designation) can give rise to manifold and striking symptoms, while large polypi, on the other hand, give rise to very few, comparatively, or almost none at all.

It would, therefore, be useless to attempt to give a comprehensive representation of the symptoms of these neoplasms, which may be caused by very different varieties of laryngeal disease.

The present knowledge of the subject furnished by laryngoscopy demands, at present, rather that we should indicate the characteristic symptoms, and explain from them the alterations founded in mechanical or physiological processes.

But we should be careful not to describe one symptom as pathognomonic, for experience teaches us that the objective laryngoscopic appearance often deviates from those which the symptoms indicate, and often in the most striking manner.

Hoarseness and Aphonia. If the neoplasm, whether great or small, has such a position that the vibration of the vocal cords is disturbed, even in the slightest degree, this fact is indicated by an alteration of the voice. A large growth projecting on the Morgagnian ventricle, or extending upon the ventricular bands, and resting on the vocal cords, may

cause a muffled, hoarse, and even an entirely aphonic voice, as well by the disturbance of the conduction of sound (breaking of the tone or diminution of the Morgagnian ventricles), as through functional injury of both, or of one or the other vocal cord.

These gradations, therefore, depend on the form of the polypus.

If this be formed in such a way that it hangs over by its peduncle into the rima glottidis, the vibration of both vocal cords will be necessarily disturbed.

If it be not pedunculated, nor large, nor of a firm texture, so that in phonation the opposite healthy vocal cord, or ventricular band is not touched, its function at first remains intact, and the production of sound on one side may cause a tolerably good tone, just as obtains in paralysis of one side.

It is just the same with small polypi, perhaps not larger than a melon seed, occurring anteriorly or posteriorly on the surface of the vocal cords. On the other hand, such a polypus, situated on the center of the cords, makes itself a *vibrating* nodule, (*Schwingungsknoten*,) and thus changes the vibrating vocal cord, in its whole length, much more than if it came in contact with a vocal cord which does not vibrate at all.

Neoplasms, which are situated on the ventricular bands, or on the ary-epiglottic folds, if not of too great dimension, and of a particularly firm texture, cause no injury of the vocal function, if there be not at the same time a general swelled condition of the mucous membrane of the larynx.

On the contrary, a marked impairment of the voice is caused by neoplasms which are small, provided they are situated on the angle of union of the vocal cords, because the complete closure of the glottis, and again the vibrations of the tone-giving membranes, are thus prevented. This is also the case, and even to a greater extent, if there be a neoplasm without a peduncle, even of the size of the head of a pin, close to the middle edge of the vocal cords. In such case, both cords undergo an impairment in vibration. A pedunculated, that is, more movable neoplasm of this sort, may, on forced articulation (or production of a tone), be driven laterally out of the

rima glottidis, and thus cause a shrill tone, or one pitched on a higher key than is intended. This happens because an increase in the number of vibrations will be transitorily induced, just as when, in a catarrh with a great amount of mucous secretion, lumps of mucus get between the *rima glottidis*, and, together with a straining in the speech, a deep hoarseness suddenly changes to a treble voice.

A new growth on the posterior wall of the larynx, that interferes with the juxtaposition of the arytenoid cartilages, has caused complete aphonia.

Without regard to the direct irritation of the vocal cords, all those laryngeal tumors, which by their large extent fill the upper cavity of the larynx, including such growths as are found on the posterior surface of the epiglottis, cause considerable hoarseness or aphonia, since, thereby, a kind of valve is formed over the air column, or at the same time the mutual contact of the vocal cords is partly or fully impaired.

The same is true of the growths found beneath the vocal cords, which can break the expiratory stream of air before it reaches a state of vibration.

From the preceding deductions we may estimate the very different symptoms of impairment of the voice, which are possible under the conditions which have been indicated, and it will be understood that neoplasms of quite a large size may occur in the larynx, without causing the slightest hoarseness.

I have but lately extirpated a polypus of the size of a grape, lying on both vocal cords, that had never caused only the mildest tickling cough. Just so, even large growths lying on the vocal cords cause no reflex irritation, while, on the other hand, even small, peduncular polypi, though they sometimes become wedged in the *rima glottidis* at intervals, in the same way as foreign bodies, may excite the most severe paroxysms of coughing, even dyspnoea and attacks of suffocation, until the expiratory stream of air throws them out, and all the irritation suddenly disappears.

Abnormal harassing sensitiveness in the throat is a symptom which is sometimes persistently annoying, when catarrhal affections are not present, especially if the polypi are mova-

ble, and change their position in inspiration and expiration. However, the various inflammations and swellings of the larynx, or of separate parts of it, cause the same kind of symptoms, so that we are not justified in regarding the above as diagnostic.

The carcinomata cause only a peculiar feeling of pain, and would be particularly characterized by attacks of a lancinating pain at night, if other symptoms were present at the same time, which absolutely establish the fact of the presence of a tumor. Pains of such a kind can with difficulty be distinguished from the nervous affections which appear in quite a severe form in a larynx otherwise quite healthy.

Difficulties of breathing depend on the size and situation of the polypus, and the physical and psychical condition of the patient. Large tumors, when they fill the superior cavity of the larynx, form as it were a spherical valve, and especially if the patient become congested through vigorous movement of the body, or through mental disturbance, give rise, on inspiration, to cyanitic symptoms. These may advance to laryngeal dyspnœa, quite similar to laryngo-spasm, until, in an interval of quiet, the respiration again becomes comparatively normal.

The expiration here speaks for itself, and is not impaired, as is the case if the neoplasm is found on the other side of the vocal cords, and is pressed against the rima glottidis by the expiratory stream of air. Smaller growths may not the less interfere with the breathing under the above-mentioned conditions, even though they close up but a part of the glottis. Sometimes a changed position of the body—lying on one or the other side—or in the deeper parts of the larynx, may cause difficulty of breathing, even unexpected paroxysms of suffocation.

The simple, valvular sound can only then be conspicuously perceptible, when the polypus is inserted in the neighborhood of the vocal cords, and in form and texture is adapted to follow the current of air on inspiration.

In such growths which occupy the cavity of the larynx in

great extent, we hear, by means of the stethoscope, a tone as though the air were forced through a narrowed place. However, this phenomena is just as perceptible in severe paralytic conditions, as in prominent swelling and infiltration of the parts of the larynx. I refer here only to the state of infiltration that appears in phthisis laryngealis.

Symptoms of dysphagia can arise only when new formations occur on the epiglottis and the arytenoid cartilages.

The course of tumors of the larynx is generally very chronic. Many patients carry polypi to the grave without being affected thereby.

In rare instances only, polypi of soft texture are coughed up, and thereby the harassing symptoms are alleviated for a shorter or longer time.

Before the employment of the laryngoscope, secondary œdema was found on post-mortem examination to be the cause of deaths by suffocation.

This, of course, cannot so easily occur in our times.

Only malignant tumors have usually a rapid course, since constitutional disease frequently supervenes, or already exists and lies at the basis of the local disease, while the benign tumors almost always have a very tedious growth, remain local, and, as a rule, are open to successful treatment under the guidance of the laryngoscope.

ETIOLOGY.

We are just as little capable of assigning a definite cause for the existence of neoplasms in the larynx, as in other parts of the body. We can merely regard it as certain that chronic or frequently repeated inflammatory conditions of the mucous membrane of the larynx favor the formation of laryngeal tumors. The laryngeal ulcerative processes should also be included here, as they are not seldom observed in the course of, or at the end of, laryngitis ulcerosa, and yet more frequently of a laryngitis tuberculosa. On the borders of the ulcers, we not unfrequently observe growths arise that are at first acuminated, and then wider and extending. In precisely the

same way, the ulcerative processes in syphilis very frequently give rise to the formation of condylomatous growths.

The persistent irritative conditions that obtain when portions of the larynx are inflamed and swelled favor the formation of carcinoma, just as is the case in cancer of the œsophagus and stomach. It also appears to be possible that hypertrophied growths of mucous tissue, with ulcerated surfaces working injury beneath, may bring on carcinomatous degeneration.

With regard to the hereditary transmission of carcinoma of the larynx, we are yet in want of suitable observations. For the contiguous organ, the œsophagus, the hereditability is established with certainty. A case of that kind has recently come under my observation.

As a matter of experience, men suffer from polypi of the larynx more frequently than women. The reason of this difference is that men, through their occupations, must be more frequently exposed to the various mechanical irritating conditions of the organs of speech. At least, we find affections of this kind most frequently in public speakers, teachers, and in those who pursue a kind of employment that compels them to overwork in a dusty atmosphere, under frequent congestive conditions of the respiratory organs.

Polypi of the larynx are least frequently observed in childhood.

The affection is most apt to occur in middle life, or in the period between the thirtieth and sixtieth year.

DIAGNOSIS.

Only the laryngoscope can give a satisfactory and exhaustive diagnosis on the presence, the character, and the position, of a neoplasm in the larynx. In rare, isolated instances, particles of soft tumors are indeed coughed up, but the question at once arises, where the seat of such a growth lies, and what is its extent.

Even when, by depression of the tongue, a polypoid growth is clearly seen projecting up on the epiglottis, it is

yet in no way proved whether, beside this neoplasm, a second, or a third, is not concealed in the larynx.

With a laryngoscopic diagnosis, all the pathognomonic symptoms, given in the various text-books with great minuteness, lose almost their whole value, and all laryngoscopists will agree with me in stating that we may be deceived in the existence of the gravest symptoms, and that too, although, by a large experience and abundant opportunity for comparative diagnosis, we may have become educated to great accuracy in the detection of neoplasms in the larynx.

In regard to the laryngoscopic examination, I should lay special stress on the fact that small neoplasms, especially if they are situated on the angle of union of the vocal cords, can easily be overlooked when the epiglottis is much inclined backward. We should not desist from the examination in such a case before we succeed in gaining a view of the vocal cords in their totality, by making the patient take deep inspirations with rapidly-following high intonation.

Neoplasms are observed in almost all parts of the cavity of the larynx, and from the quite numerous cases examined and reported, quite a positive opinion may be given, not only as to the place of origin, but also as to histological properties of the growths.

Unquestionably the vocal cords and their upper surfaces and borders are most frequently the seat of neoplasms; next, the Morgagnian ventricles, the ventricular bands, and anterior wall of the larynx, together with the angle of the glottis, lig: ary-epiglottica, arytenoid cartilages, epiglottis, wall and inferior cavity of the larynx, together with the trachea.

If the vocal cords, that have few mucous glands, evince a particular disposition for new formations, it is attributable to the fact that these ligaments, clothed with mucous membrane, especially if they have been already the seat of an acute or chronic inflammation, are more liable than any other part of the larynx to almost ceaseless activity and irritation, partly through spontaneous movement, and partly through the vibration of air. The posterior wall of the larynx is easily raised to great activity without being specially disposed

to new formations. However, there is here quite another mechanical condition. While the vocal cords suffer only a comparatively small straining and relaxation, so that on the whole they do not experience a very marked change of form, we find that the mucous membrane and sub-mucous tissue of the posterior wall of the larynx, localized in a small space, is folded into grooves.

This process can not possibly give the imbedded mucous glands rest enough, and rarely goes farther than a hyperplastic condition, and a sprouting up of small pointed vegetations, while the permanent mechanical irritation favors the destruction of the glands scattered in the inflamed and swollen mucous membrane, which are also affected, and excite larger or smaller ulcers, upon whose bases or edges small villous-like fibrous vegetations arise.

In regard to the histological structure, we most frequently observe fibromata and papillomata, more rarely cancrioid ganglia tumors and lipomata.

The fibromata are observed of different sizes, and usually standing alone.

In the early stages of their development, they appear of the size of the head of a pin, of a nodule; farther on, of the size of a pea, hazel-nut, or walnut; and present a dirty white, clear red, or, in rare cases, a dark bluish-red venous color. The white color may be accounted for, by the fact that, through the imbedding of small or large masses of mucus or fatty tissue in the connective tissue, a mixture of colors results.

The bluish color depends particularly on the large blood supply of the epithelium.

Most of the fibromata are pear-shaped, or have a quite round body, with a thin or thick peduncle. Sometimes they are of an oval form, and are situated directly on the mucous membrane and diffused over it. Under such circumstances the portion of the larynx lying opposite, especially the ventricular band, in the course of long-continued irritation, may suffer an inconsiderable deformity.

Pedunculated fibromata, if they are inserted on the vocal cords, or on the Morgagnian pockets, not unfrequently hang

pendulous in the inferior cavity of the larynx, and will at times be cast upon the vocal cords in forcible expiration. Many polypi of such a kind also show a broad, long fold, extending directly into the angle of the vocal cord, on which the white or red tumor hangs down into the inferior cavity of the larynx, and in phonation comes distinctly under the eye of the observer. A case of this kind I have recently observed and operated upon.

The upper surface of the fibroma appears usually smooth and brilliant through the epithelial covering, but sometimes also folded, rugged, and granulated. The lobulated is the most rare form.

I have lately operated upon a case of this kind. Under the growth, which was about as large as a cherry, there was a second, smaller, berry-shape neoplasm, which was attached by a very small peduncle, to the right vocal cord, and laid upon the other, although it was movable.

The growth is very slow. In patients from other countries, whom I only see on their way through Berlin, once a year, I have observed such polypi for years, without being able to detect any marked enlargement. This is especially true of the round pedunculated fibromata.

Local relapses after extirpation I have not yet observed, nor have I seen any where any communication opposing this procedure. The discharge of blood on incision or puncture is comparatively little.

When we find it necessary to make an incision in fibromata of rigid fibrous tissue, we feel the great resistance of the tissue distinctly under the knife.

The papillary tumors (papillomata, condylomata) are distinguished from the fibromata at first glance by a softer character of tissue, which is especially recognized by a combination of forms resembling a cauliflower, mulberry, or grain of corn.

In the first stages of development, there is only small, whitish-gray, pointed, filamentous, cone or bud-like papillæ, growing from the mucous membrane, either separated or grouped together.

This is the simple formation, but in the complicated we

find single or more connective tissue twigs lifted up from the mucous membrane, upon whose branches and ramifications the variously-shaped papillæ appear and group together, and look sometimes like isolated, again like extensive umbellated, polypoid masses.

For the purpose of classification, we may distinguish two principal groups—the berry-like and villous laryngeal papillomata—between which there are, of course, many variations in form. They may resemble raspberries, strawberries, grapes, and sometimes have a cauliflower-like, or cocks-comb appearance.‡

The berry-like papillomata are always branching papillæ, because each berry sets upon a branch of the small stem-like process, and several of these, lying together, form a berry-like *conglomeration*. The villous papillomata, on the contrary, appear as structures composed of very long, delicate, fringed, simple or branching papillæ, interwoven with each other, and attain a very diffuse growth. Occasionally we see the whole laryngeal space filled with an umbellated or cauliflower-like growth.*

The color of the papilloma appears chiefly white, or grayish-white, rarely pale red. The growth is often very rapid. The vocal cords, ventricular bands, lig: ary-epiglottica, posterior wall of the larynx, and posterior surface of the epiglottis, are the more common seats of papilloma. They also frequently grow directly underneath or on the angle of union of the vocal cords, and lie against the posterior and inferior surface of the epiglottis. Thereby the cushion of the epiglottis easily renders the inspection difficult, or makes it impossible to find it on a superficial examination. Such small formations may cause considerable alteration in the voice.

The wart-like condylomas are found more frequently in the posterior portion of the vocal cords and ventricular bands.

Cancroids on the vocal cords themselves have not been observed as yet, either on the post-mortem table, or, in laryngoscopic examinations. The first case of this kind (two large pedunculated cancrroids on the right vocal cord), was presented to me during the past year. The tumor first extirpated returned three and a half months afterwards. The case was reported in the *Berliner Klinischen Wochenschrift*, 1866.

We not seldom observe, in advanced stages of laryngeal tuberculosis, on the softened, infiltrated, basement membrane, or in the neighborhood of ulcerated papilloma, growths that are distinguished by a whitish-gray color. Here, also, there is not much hemorrhage after incision.

The *epithelial cancer*, either as cancrioid or as encephaloid, is quite rarely observed, either isolated or widely diffused. As the first beginnings of the formations do not afford characteristic external types, it is less possible to make an approximately certain histological classification by a laryngoscopic examination, than in the benign forms of neoplasms. Both forms present, in their first formation, only bulbous-like prominences of the sub-mucous tissue of the larynx, which afterwards increase in size as round, knobby, pale or dark-red bulbous tumors.

The cancrioid appear more rarely as round, circumscribed, pedunculated adherent growths, more frequently diffused, bordered, irregular prominences, which, as they increase in size, occupy certain parts of the larynx, especially the lig: ary-epiglottica. Sometimes one or both of the vocal cords are entirely covered, and even considerable narrowing of the larynx may result.

If the cancrioid begins to disintegrate, ulcerations are seen on the surface, which, advancing gradually, may lead to degeneration of the sub-mucous tissue lying beneath, and even of the cartilaginous structure.

The destruction of the neighboring parts depends chiefly on the peripheric growth of the cancerous prominences, since these continually form new cancerous masses out of the surrounding tissue, or through proliferation of the cellular connective tissue, until the cancerous mass entirely metamorphoses the healthy portions. In no other kind of neoplasms of the larynx, even in advanced stages, do we observe such a progressive loosening of masses as is the case in carcinoma.

The *encephaloid* likewise appears as circumscribed, or as a diffuse tumor.

It is a kind of smooth, round, lobulated, cauliflower-like

growth, resembling a polypus with a broad base and broad peduncle. Its color is whitish-gray or reddish. The soft form resembles extended papillary growths, and at the same time is more inclined to ulcerative destruction than the canceroid, and readily gives rise to hemorrhage under mechanical irritation.

The vocal cords, have not, thus far, been found primarily attacked with carcinoma. On the contrary, it is more frequently seen on the epiglottis and lig: ary-epiglottica.

Carcinoma easily attacks the larynx secondarily from the cesophagus.

In every carcinoma of the larynx, the laryngoscopic investigation shows that almost the whole of the mucous membrane and sub-mucous tissue of the larynx participates in the chronic inflammatory process, and more than in any other neoplasms. The functional disturbances are also more prominently declared than with malign tumors.

The encysted tumors containing colloid substance, are very rarely formed in the cavity of the larynx. According to a statistical comparison between about eight hundred cases of disease of the larynx, I have observed only one such case; but I have observed it repeatedly on the vocal bands; on the other hand, only once on the cushion of the epiglottis. Here the tumor appeared as a flat elevation of the tissue of the mucous membrane of the size of a grape. It was free from all inflammation, and its pale color allowed the whitish contents to show through.

On the surface of the vocal cords such a kind of a process presents a silver gray or yellowish-white tumor. On the borders of the vocal cords, as I have observed, it is only a yellowish blister-like protrusion of the mucous-membrane, of the size of the head of a pin or of a grain of hemp.

Such a kind of a protrusion on the borders of the vocal cords interferes with the lying together of the borders of the glottis, and causes a peculiar shrill tone in phonation.

The contents of such a cyst consists of a viscid, whitish mass, which, as we can ascertain by laryngoscopic examination, squirts forth on the slightest incision.

Lipomatous neoplasms quite rarely appear in an entirely

uncomplicated form. They are usually a transition stage between fibroma and lipoma. The lipoma is distinguished as a roundish, usually a polypus-like tumor, hanging on a vocal cord, of prominently white, pale yellow color, and may reach a considerable size. It grows with more unequal rapidity than the fibroma. The lipoma also can take its origin in the neighborhood of the larynx, and even project into its cavity. A tumor of this character—the largest hitherto observed—I have lately seen in a clergyman. The tumor, smooth and white, of the size of a walnut, adhered, by a thin peduncle, to the entrance of the œsophagus, a little deeper than the level of the arytenoid cartilage, and lay as a spherical valve on the laryngeal aperture. The tumor was not accessible to an operative procedure. Therefore tracheotomy was resorted to by division of the thyroid cartilage, after which, the patient unfortunately died of a diffuse bronchitis that supervened.

PROGNOSIS.

The prognosis in polypi of the larynx that appeared so unfavorable hardly ten years ago, since the introduction of the laryngoscope, has lost its terrors.

At the present time, the apprehension of the sudden or gradual coming of dangerous suffocation which we formerly associated with those neoplasms, has diminished in the same degree in which they have become more accessible for diagnosis and therapeutics.

The prognosis becomes the more favorable since, as a matter of experience, the greater number of polypoid growths advance extremely slowly in their growth. They are usually diagnosticated in their early stages, and then they cannot so rapidly produce threatening symptoms.

Even when polypi come under laryngoscopic observation after they have been in existence a long time, and have reached advanced stages, appropriate and successful therapeutics can always be employed with the aid of the mirror.

We are far from being able to remove polypi of the larynx in every case, under the laryngoscope, by an accurate

operative procedure. However, we can with certainty remove all danger to life, since in the less accessible cases we can, if no more, make the growths smaller.

When we are not able to do that, we can, by sufficiently controlling the local condition, ward off a sudden suffocation by opening the trachea at the critical moment.

Fibromata and lipomata usually grow most slowly.

Growth occurs more rapidly in papillomata and cystic tumors, but in the latter only to a certain extent. Carcinoma advances most rapidly when it occurs secondarily on the larynx.

Benign tumors do not appear to recur. At least, in no case operated on by me have I observed that the new formations removed by means of cutting instruments, or by caustic, have displayed a tendency to grow again.

Carcinoma, if they are pedunculated, offer a tolerably good prognosis. But if they are extended in a diffuse manner over any part, or if they were already present in neighboring organs, and only extended to the larynx as a secondary affection, they always have a fatal issue, and in respect to an operation must be considered as a *noli me tangere*. Tracheotomy is to be regarded as necessary only for the postponement of the fatal termination.

In many cases the removal of the polypi fully restores the voice. The result depends on the position and extent of the growth. Pedunculated polypi always give a favorable result, especially if they do not have their insertion on the border of the vocal cords. In such growths as have become widely extended on the vocal cords, thickenings and cicatrices may remain, and these may injure the power of extensive vibration.

By the intimate adhesion of the vocal cord with the neoplasm, such a great destruction and change in the normal tissue of the former may occur, that a perfectly clean separation of the growth is not possible.

THERAPEUTICS.

Internal medication for the removal of laryngeal polypi is fruitless. Only by surgical operations—the use of instruments—either through the mouth, under the guidance of the laryngoscope, by cutting, crushing or cauterizing, or externally, by division of the thyroid cartilage and extirpation, will our treatment be successful.

At the commencement of this chapter, we must offer this preliminary remark, that all operations undertaken with the aid of the laryngoscope, but especially those attended with loss of blood, unquestionably belong to the most difficult and delicate in the whole department of surgery, so long as we do not succeed in producing extensive anæsthesia of the throat and parts of the larynx, so that we are able to keep our instruments as long as we please in the nervous and sensitive cavity of the larynx.

It does not lie in the province of this work to give a treatise on laryngoscopy, or on the complete art of laryngoscopic surgical operations. Facility in laryngoscopy we presuppose.

In regard to laryngoscopic surgical operations we would present, with the greatest possible brevity, what is of special reference, and what has been proved to be of service among the procedures that have been adopted in this new department.

GENERAL PRELIMINARY CONDITIONS AND REQUIREMENTS FOR LARYNGOSCOPIC OPERATIONS.

For all laryngoscopic and surgical operations undertaken in the larynx by means of cutting instruments, there are a number of conditions required, on the part of the patient himself, of the physician, and of the instrumental apparatus. On the fulfilment of these depends the attaining of a good result.

First of all, the patient must voluntarily meet the operator half way, and aid him by a resolute co-operation.

In order to render this possible, very irritable, sensitive and restless patients must, for a long period, become accustomed to quietly holding the head in position; to the necessary and protracted opening of the mouth; to an energetic stretching and pressing out of the tongue; to enduring the presence of the mirror, and to the introduction of instruments at the same time; to the holding of the breath by intervals, and to the annoyances and pains caused by irritating the parts of the larynx.

If severe catarrh of the throat exist at the same time, it is necessary to remove it by appropriate local medication, (daily pencilling with solutions of nitrate of silver, $\mathfrak{z}\text{i.}$ to $\mathfrak{z}\text{i.}$.) since this complication makes it difficult to use the mirror for a long time. If the tonsils are much hypertrophied they must be removed beforehand. Also, a temporary laryngitis caused by the new growth should be modified by touching with a sponge. The sensitiveness of the throat and mucous membrane of the larynx will thus be at the same time alleviated.

The majority of patients soon become accustomed to a

voluntary easy position of the head.

When they do not, the head may be held by an assistant, or by a "head rest," which is adapted not to hold the cervical but the occipital region.

The operator must make himself skilful in the introduction of the mirror with the left hand. The ordinary rules for laryngoscopy must here be observed with special care and attention. He must understand how to get the inverted image in the mirror at an exactly correct distance, opposite the separate portions of the larynx in every instance, in order to bring the instrument in the right hand to the corresponding place, and remove it again so accurately and rapidly as not to injure the neighboring parts.

Oftentimes we cannot operate more than a second with the instrument in the cavity of the larynx.

Such an instant we must know how to improve, and all the more because the patient is not equally well disposed at all times, and the parts of the larynx do not always appear in the same convenient position.

Therefore the operator should never lose his self-control if these practices demand a quite considerable time, and necessitate the repeated and fruitless withdrawing of the instruments for many sittings. All violent and forcible procedures are fruitless and blameworthy in laryngoscopy, and all the more when a difficult operation, with a cutting instrument, is to be attempted at the same time.

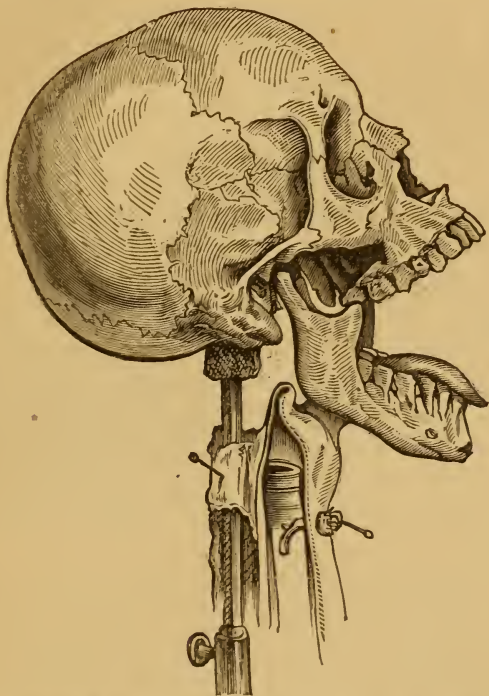
[Fig. 23 represents the phantom for practice described by Tobold in his "Lehrbuch." This very convenient and useful arrangement consists of a skull, fastened to an iron stand by the foramen magnum, in such a way that it can be slid up or down. To this is attached either an artificial larynx, or one taken from a dead subject. A larynx can easily be made out of pasteboard, provided care be taken to preserve the relative dimensions. The distance between the hard palate and the level of the vocal cords must be about three inches.

If the larynx be taken from a dead subject, it is best to fasten it to the stand by the œsophagus.

In order to practise the various operative procedures, we

place the phantom in the position of the patient described in

FIG. 23.



PHANTOM FOR PRELIMINARY PRACTICE OF THE ART OF LARYNGOSCOPY, AND
THE OPERATIVE PROCEDURES OF LARYNGEAL SURGERY.]

the Introduction and illustrated in figure 24 (laryngoscopic position).

The under jaw should be drawn down, the tongue should be in an extended position, and the cone of light from the illuminating apparatus should be thrown directly into the opening of the mouth.

For those who, at the outset of their study of laryngology, cannot find patients who are sufficiently imbued with the spirit of science to be willing to make themselves martyrs in the cause, this simple contrivance for practice may be made of great service.]

INSTRUMENTAL APPARATUS.

The number and variety of the laryngeal pincers, forceps, shears, knives and excrascers, that have already increased to such an extent, proves very clearly the great difficulties under which laryngoscopic surgery labors. The complication of instruments, however, is at least adapted to overcome the hindrances that lie in the way. All those laryngologists who, since the introduction of laryngoscopy, have busied themselves with the removal of laryngeal polypi, must share my conviction that the simplest, thinnest instruments, that hide to the least degree the image in the mirror, are the most suitable.

I believe that I do not go too far when I assert that a simple, strong iron wire, curved like a catheter, and terminating at its extremity in a pointed, double-edged knife, is the most convenient instrument for the majority of cases. In the course of four years, during which I have given special attention to laryngoscopic operations; I, at least, always return, more and more, to this form of knife originally used by myself and others.

But I will by no means assert that I do not use other instruments in some cases. Each special case demands special instruments. But as far as possible they should be *cutting* instruments, and not those which bruise or lacerate. The whole instrumental armamentarium is on this type.

Some authors seem to enjoy the construction of new instruments, without any recognition of what has preceded them. Fortunately the time has gone by in which an inventor may acquire fame by a ring or a screw, or when struggles as to priority in such non-essentials may occur.

In the great variety of cases that occur, very definite rules for the special kind of cutting, crushing, or cauterizing instruments to be employed, cannot be given. The operator must use his judgment in each individual case. The special choice and form of the instruments depend on the character of the throat and larynx (whether narrow or wide), on the situation of the polypus, and the nature of its insertion.

In wide throats, when the epiglottis stands erect and

prominent, and a neoplasm is found above the vocal cords, yet not extensively diffused, a shear-like knife and crushing forceps are to be employed. At all events, they should be used in those cases where the polypi impend from the vocal cords in the inferior cavity of the larynx, and a wide glottis allows us to get around the tumor before the reflex contraction occurs. In cases of an opposite nature, however, where the throat is small, the tongue fleshy, and the laryngeal space narrow, the operator may regard himself as fortunate if he succeed in introducing the most delicately constructed knife without otherwise disturbing his manœuvres in the cavity of the larynx. For such cases—and they are the most frequent—the simple knife with a lance-shaped extremity, the handle of which can be bent by the operator, according to the situation of the polypus, is far the most suitable.

If the cavity of the throat is wide, it is unnecessary to cover the instrument. When the passage is narrow, I always prefer a concealed knife.

The instrument is best held and introduced by three rings placed on the handle, and designed for the thumb, index finger, and middle or ring finger, or by means of a flat handle held like a pen by the the thumb and middle finger. If the knife is concealed at its extremity, the index finger causes the cutting surface to emerge by pressure on a spring, devised by *Semeleder*. Such covered or concealed instruments should always have a retraction spring on their handle, so that, at the moment of operation, the surgeon has only to cause the knife to protrude, by a slight pressure of the finger.

SPECIAL PREPARATIONS IN UNDERTAKING LARYNGOSCOPIC OPERATIONS.

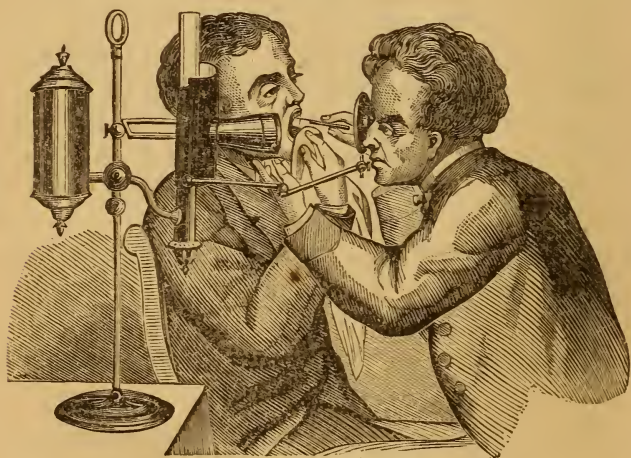
A good illuminating apparatus, that gives an intense light-cone, not too small, and proportionate to the light disk, is the next requisite for operative procedures as well as for laryngoscopic examinations. The reflecting mirror must also be attached to the apparatus, or at least to a firm stand, so that there may be no unsteadiness in the light. On this account,

I hold that the illumination of the cavity of the throat by means of a reflector fastened on the forehead or before the eyes, is not as satisfactory, nor as suitable, as when the light comes from an ordinary lamp, a shoemaker's cone, or from an illuminating apparatus, since the operator, who has to direct his attention to many points, should not be hampered by attending to the position of his own head.

Both forms of illuminating apparatus that I have devised—the larger and the smaller (the latter the so-called pocket laryngoscope)—have hitherto completely fulfilled all these indications.

The apparatus is placed at the right of the patient, just as in any ordinary examination, with the body of the flame on a level with his mouth, rather above it than below it, and the reflector accurately adjusted, so that the bright rays illuminate uniformly the opening of the mouth and the posterior regions of the throat.

FIG. 24.



LARYNGOSCOPIC POSITION.

The patient, sitting opposite to the operator, as near as possible, and without any feeling of restraint, can either keep his head steady himself, or allow it to rest against the holder, or to be supported by an assistant. The tongue is held fast by

the patient himself, by means of the right hand (index finger above and thumb beneath), a linen towel being placed on the end of the tongue. I regard it as very improper for an assistant to hold the tongue, as the patient is usually timid and awkward when such kind of aid is proffered. In general, we may say that an assistant is needed only in the rarest cases. If the patient (without regard to the impossibility of keeping the head still that results from nervous weakness) has not the will and firm determination to aid the operator in his difficult work, then assistance must be employed.

For this reason the method of holding the tongue out with a broad forceps, can never find imitators among experienced laryngologists.

At the beginning of the operation, the laryngeal mirror and the necessary instruments must be placed conveniently near the investigator.

The operator first introduces with the left hand a simple, round glass mirror, that is not too large, and that has been warmed, into the usual position against the uvula. Directly afterward, he introduces an ordinary German-silver wire, correspondingly curved and also warmed, provided with a handle, and with a blunt extremity, without touching the separate parts of the mouth and cavity of the throat, and without allowing the point of the instrument to disappear from the image in the mirror until he reaches the polypus. By undertaking the procedure repeatedly, the patient gradually becomes more and more accustomed to it as well as to the irritating contact with the polypus. If this object be successfully attained, we may attempt the introduction of the instruments that we consider best adapted to the case. We should never forget to thoroughly warm the instrument previously, since the cold of the iron is just as sensibly felt as the contact of the instrument itself.

The fixing of the mirror in position by a mirror holder is entirely useless, and the inconveniences of such a procedure are so obvious that it is hardly necessary to waste words in speaking of it. The epiglottis is decidedly the greatest impediment in the performance of laryngoscopic operations.

Only in very rare cases, does this have such a perpendicular position that it does not interfere when we attempt to get over or behind it to the part of the larynx that we desire to reach. Even when the epiglottis appears to stand in a favorable position in the preliminary investigation, it sinks more or less at the moment when we are on the point of introducing the instrument. This accident disturbs the operation exceedingly when the polypus is inserted on the anterior portion of the larynx, or directly on the epiglottis close to the angle of union of the vocal cords.

This inconvenience caused laryngologists at first to resort to the use of a holder for the epiglottis. All such attempts, however, must always fail, because the instruments in them, which grasp on the posterior surface of the epiglottis, cause as strong reflex irritation as when one touches the root of the tongue with a finger. Even forceps covered with soft substance, as gum elastic, will not be borne. Moreover, I could not secure the result, in all my own attempts, because the forceps that I used, which only seized the extreme border of the epiglottis, slipped off every time strong traction was used.

We must, therefore, regard the idea advanced by Von Bruns as a grateful assistance, to enable us sometimes to perform laryngoscopic operations with better success. He constructed a forceps for the epiglottis, which pressed the point of a needle through its extreme border, thereby of course preventing the slipping off when traction is exerted. The application of such a kind of forceps is to be attempted in all cases where it is not possible to introduce and operate with the instruments without holding the epiglottis upright. But, unfortunately, there are many patients who, in spite of all drilling, will not endure the introduction of a pincette.

If the irritability appear to depend on a coincident laryngitis, this must be first removed as far as possible in the critical condition of the patient, by daily touching with the sponge and the necessary general derivative treatment.

But without regard to whatever laryngitis may exist, touching with a sponge is a procedure that is best adapted to diminish the sensitiveness of the mucous membrane of the

larynx, and to make the same more capable of enduring the irritation of instruments.

All the preliminaries before described are, of course, demanded *in extenso*, only in those cases where we desire to operate with cutting, crushing, or noose-like instruments. For the use of instruments conveying caustic, usually, no special preparation or practice is requisite.

It remains for me to say a few words in this chapter on anæsthetizing the larynx. All attempts that have been made for this purpose have, thus far, been fruitless.

Not the bromide of potassium, internally or externally, nor the pencilling with chloroform or with morphine, nor the local operation of cold, have answered satisfactorily the hopes that have been entertained. Subcutaneous injections of morphine, also, have not been able to produce a sufficient anæsthesia. This powerful adjuvant for the operations on the larynx still remains, therefore, as a *pium desiderium*.

We can only diminish the sensitiveness of the mucous membrane of the larynx for the time. This is best accomplished by the local use of astringents (solutions of alum or tannin), by means of a sponge, touching all the walls uniformly.

SPECIAL METHODS OF OPERATION.

The choice of the method of operation depends on the situation, the size, and the manner of insertion, of the polypus. Every separate case is not to be treated by a single method of procedure. Usually two or more methods must be brought into play.

In the following description we shall speak of the removal of tumors of the larynx by excision, cutting to pieces, bruising, crushing, ligation, and destruction by caustics.

1. *Extirpation, Cutting to pieces, Puncturing*.—This procedure is in all cases always first to be brought into consideration, when the absolute impossibility of introducing cutting instruments into the cavity of the larynx, and operating with them, does not prevent. That there are such

cases, we must admit here also, just as we have done already in another connection, without thereby affecting the value of surgical laryngoscopy.

In order, furthermore, not to weary the reader through descriptions of separate instruments, I will, in every case, briefly refer to the most important part of the instrument, and shall seek to make clear the rest of their mechanism by drawings.

All growths, with thin or thick peduncles, that are situated above the vocal cords, and that occupy a position on the lateral walls of the larynx, including the tumors inserted on the borders of the glottis and hanging down into the cavity of the larynx, are particularly adapted for the use of a knife that cuts in a straight direction.

The instrument is covered, or not, according to the capacity of the pharynx and larynx. The knife, at its extremity, has a form like that of a cataract knife, or it is in the shape of a lance, and operates by puncture and traction, or it terminates in a small, slightly curved probe-pointed knife, that, on one side is sharp, and anteriorly or posteriorly has a rounded beak. Therefore, it is less liable, on introduction, to injure the walls of the larynx.

The particulars of the operation are as follows :

While the patient breathes calmly, the knife is introduced over the epiglottis, under the guidance of the laryngeal mirror, and without losing its point from the image in the mirror, until it reaches the place of insertion of the polypus. The knife (fig. 25), cutting two ways, is stuck quickly into the place of insertion, and then, according to the breadth of the insertion, a shorter or longer movement backwards and forwards is made, in order to enlarge the incision.

The knife with a single-cutting edge (fig. 26) is then introduced deeper down, until over the place of insertion, and then makes quickly a movement directed forward and backward.

Only at the moment of the incision can the performance of the operation be accurately scanned and watched over.

As soon as the irritation takes place, reflex contraction of the walls of the larynx occurs, and the incision itself is no more to be seen, or at least cannot be accurately criticised.

For polypi projecting on the posterior wall of the larynx,

FIG. 25.

FIG. 26.



or directly above the anterior angle of the glottis, a transverse cutting knife is necessary.

When we use the concealed knife (fig. 27), that is one

FIG. 27.

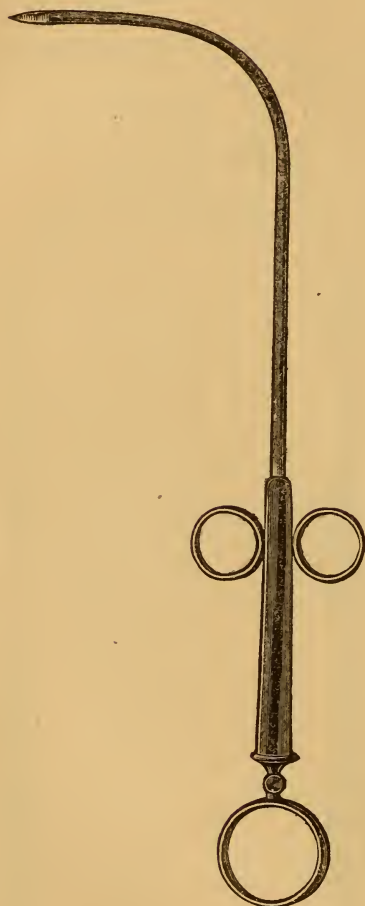


FIG. 28.



provided with a covering of silver tube, we always direct the end of the instrument close to the place to be cut through, and force in the point of the knife by pressure.

Growths which are situated, with broad bases, over the basement membrane, can, in favorable cases (chiefly by many repeated incisions), be brought to such a stage that they are deprived of their nourishment, and fall into a process of mor-

tification, and the remains can be removed by means of a crushing forceps.

In the so-called vesicular polypi, we operate best by cutting into, or scratching the elevated cyst, by means of a lancet-knife when the colloid mass flies out. In *ektasia*, of the size of the head of a pin, such as occur on the borders of the vocal cords, an instrument like a probe, the point of which terminates like a surgical needle (fig. 28), is the most appropriate. In all neoplasms that grow above the vocal cords, the operative procedure is much easier than in such as adhere to the vocal cords with a broad peduncle, because, in the latter, it is necessary to keep within the border, between the peduncle of the polypus and the edge of the vocal cord, with great precision; also to introduce the knife in a direction as parallel as possible with the vocal cord. Moreover, at the moment of touching, the field of operations is lost to view, since, in the reflex contractions that are excited, the ventricular bands at once lie close to each other, and the vocal cords, together with the polypi, disappear. But in the superior cavity of the larynx, a certain aperture always remains; and after incision, the growth is not wholly removed from sight.

If the polypus be not entirely cut through, at its insertion, and yet so much so that it only hangs by a thread-like ligament, we go behind this with a forceps correspondingly curved, in order to loosen it; or we leave it to be expelled by a natural process. It is not so much to be feared that the polypus will fall down into the bronchial tubes, as it is usually cast out by reflex irritation; or, if this is not the case—if the walls of the deeper portion of the trachea are fleshy and little irritable, it may remain for some time without causing important symptoms, and will afterwards be expectorated as detritus, mingled with sputa. It also not unfrequently happens that the polypus falls into the pharynx, and is then swallowed.

I have more and more abandoned the use of scissors-like instruments, because, on account of the great size that they must necessarily have, they limit and darken the space for

an operation in the cavity of the larynx very much. Their cutting portion, therefore, cannot be accurately seen and followed in the image of the mirror.

Only when the laryngeal space is wide, and the other conditions favorable, are such complicated instruments to be recommended. For polypi that are prominent and fungus-like, I use scissors that cut horizontally, one blade of which carries a small hook, to seize the polypus after it is cut off (fig. 29).

FIG. 29.

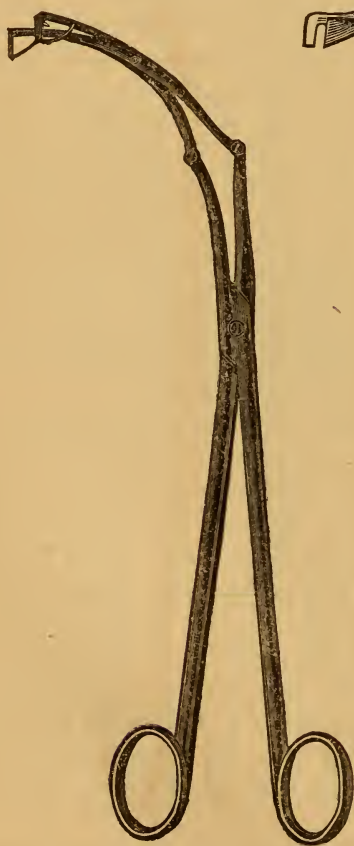
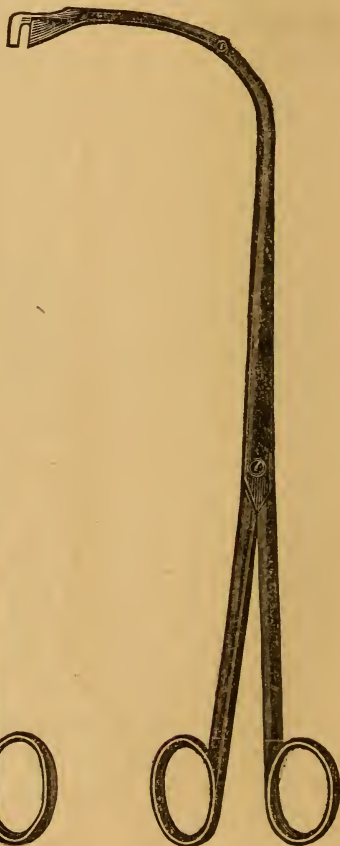


FIG. 30.



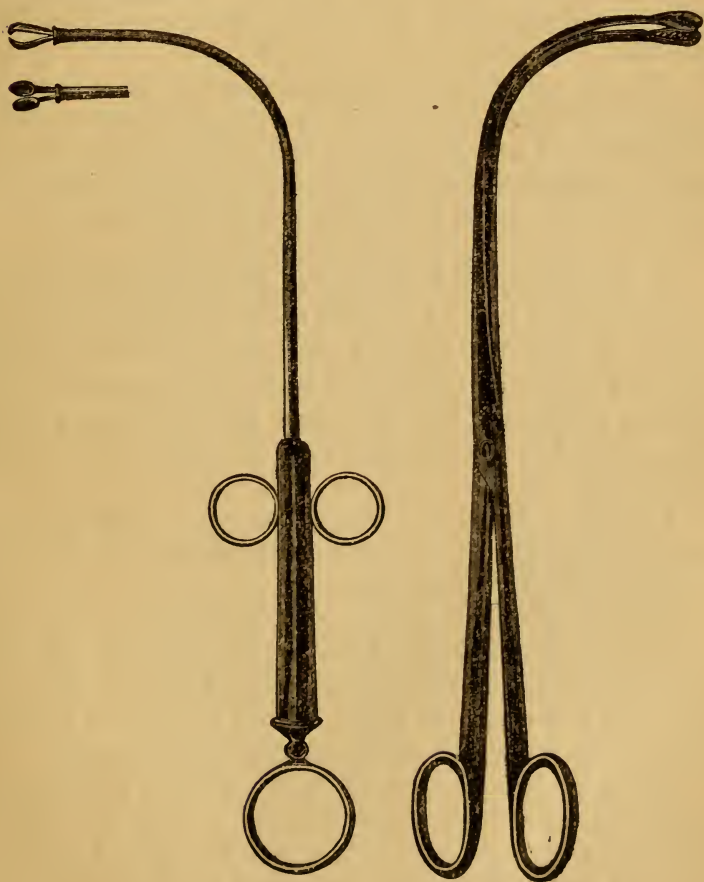
For the neoplasms hanging by a horizontal insertion in the walls, I recommend scissors that cut perpendicularly (fig. 30). They are always introduced in a closed condition,

and then the extremity is passed behind the growth. They are then opened quickly, and a blade is introduced anterior to and beneath the place of insertion, in order to cut it off by pressure.

In large growths, especially those that hang loosely down on the borders of the vocal cords, it is sometimes advantageous to

FIG. 31.

FIG. 32.



select an instrument operating in two ways. A hook pincette, that can be shoved forward by pressure, and is capable of retraction by its elasticity, is united with the lance-shaped knife

already mentioned, in order to assist the cutting, by stretching the masses of tumor after they are seized—just as obtains in all other operative extirpations. (Fig. 31.)

If, as usually happens in the case of tumors inserted in folds and with a broad base, we cannot succeed in ending the operation by one incision, but rather the mucous membrane on which the separated fragments still hang, remains broken up, it is necessary to use a beaked pincette (fig. 32,) correspondingly curved, in order to seize the growth and bring it forth.

The laryngeal polypi guillotines, formed according to the tonsillotom of Fahrenstock, are in the highest degree adapted for quite small, smooth growths, with short peduncles inserted in the walls, since we can operate with the instrument after we have succeeded in seizing the polypi with a wire-noose.

2. *Crushing up with Forceps and Pincette-like Instruments.*

—Crushing can only be resorted to in such neoplasms of the larynx as have free and thin peduncles, and project into the cavity of the larynx, singly or in a mass (pedunculated fibroid, lipoma, papilloma), but not where the firm masses of the tumor extend in protuberances into the tissue of the mucous membrane.

I am more urgent in using the expression crushing up, because instruments have been constructed with which polypi may be crushed and torn out.

Such a procedure must be more decidedly condemned, since the separate parts of the larynx, especially the vocal cords, are much too delicate organs to have their parts, that are chiefly of a firm texture, pulled or torn out without considerable destruction of substance and organic disturbance.

In the method of crushing up, merely the energetic and repeated pressure of the tissue concerned will cause a destruction of the conditions of nutrition and a process of mortification, and then, without much tearing, the dead portion can be separated from the uninjured base membrane.

As crushing instruments, we use forceps and pincettes. These must generally be made somewhat firmer than the

above-mentioned laryngeal instruments, as they can develop a greater power. The forceps that I use is quite similar to an ordinary pharyngeal forceps, only the curve is correspondingly greater, the blades crossed and provided with extremities. The little spoons have sharp angles, and internally short tooth-like extremities.

It is improper to provide such kind of instruments with long, hook-shaped, projecting tips, because these press into the mass of the tumor, interfere with the removal of the forceps, or make it very difficult, to say nothing of the destruction of the parts that may be caused.

When the laryngeal space is very narrow, these forceps, that are so unavoidably large, are not as suitable as an instrument that works like a pincette, although, on the other hand, the pressure with the former can be exercised independently and according to the requirement of the operator, but in the pincette this must be left to the force of the spring.

I have lately improved instruments that answer for the removal of masses of tumor. They are quite similar to those already mentioned, with this change only, that instead of the hook-shaped, beaked shank, with two spoon-shaped extremities, the end of the tube that forms the covering has a somewhat bulbous extremity, in order to give a larger hold to the beaked pincette.

Both instruments are introduced closed, and are first opened at the moment when, under the guidance of the laryngoscope, we reach the mass to be crushed to pieces. In withdrawing, it is well to take care that the blades do not easily open by the pressure that is used, thereby injuring the parts by tearing.

3. *Extirpation by a noose.*—Since the introduction of laryngoscopy, it has become very well known among all laryngologists, that cases of polypi are comparatively frequent, for the removal of which (among the great mass of instruments recommended) such also are used that have special reference to the method practised by Koderick, which consists in surrounding and cutting through the foreign growth with a noose of the modern *écraseur*.

However easy this procedure may appear, theoretically, it is difficult to employ it, because the comparatively thin wire noose usually loses its proper form before it reaches the desired spot. The reasons of this are, that the epiglottis inclines backward in its position, and because the space within the

FIG. 33.

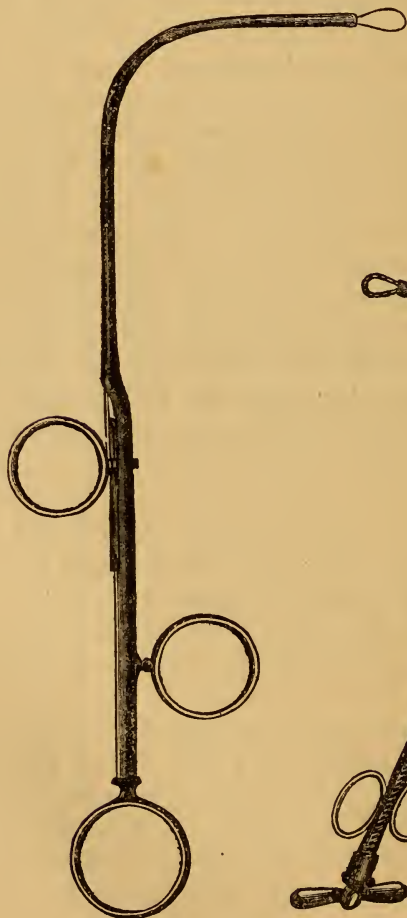


FIG. 34.



larynx is too limited for such operations. Moreover, it repeatedly occurs that the wire is broke on traction.

Such growths only are adapted for this method, as project by a peduncle into the cavity of the larynx, or, at all events, such as sit or hang on the basement membrane in a lobulated form (papilloma), by means of small narrow spots of insertion.

According to my experience, when the superior laryngeal space is entirely filled up with papillomatous growths, the noose will give very unsatisfactory results, because a wire of the size of a *millimetre* easily loses its noose shape when it is pressed against masses, even though they are soft. For such cases, I have seen good results from the use of the crushing forceps, and better results still from the galvano-caustic.

The use of wire nooses is readily adapted to neoplasms on the epiglottis, although a case fell under my observation, in which the great irritability of the patient did not allow the noose to be put around.

Gibb has recently given an account of a laryngeal constrictor, an instrument in which the calibre that serves for the entrance of the wire noose is divided by a little oblique band (thus making an opening for each wire to be drawn through), so that, on traction, the perfect entrance of the wire-noose into the canula, and the complete separation of the tumor, must be quite impossible (fig. 33). This fault I have avoided, but otherwise, in the construction, I have modelled after Gibb.

4. *Galvano-caustic*.—Although, through the ingenious inventions and labors of Middeldorpf, galvano-caustic has become very successful in the removal of tumors from other parts of the body, or from other cavities less sensitive or that can be anesthetized, it is yet proved to be of comparatively little advantage for the removal of tumors in the cavity of the larynx.

The principal cause of this is, that inasmuch as the larynx is one of the noblest, most sensitive, and most easily injured organs, it is impossible to control the galvano-thermic effects on it sufficiently, and when once there is destruction of substance, it is never again repaired. Moreover, every galvano-caustic instrument must remain on a definite spot for a long time before it can take effect. Therefore, the most violent

reaction by coughing results before the special operative procedure is commenced. This interrupts the operation, or renders it impossible. Furthermore, through the closing up of the walls of the larynx, caused every time by the reflex irritation, the hot wire must necessarily affect the healthy parts that lie over against each other, and excite there large spots of ulceration, to say nothing of the fact that the effect of the hot wire, on the spot that is operated on, is to draw the neighboring parts by sympathy more than is desired. For these reasons, galvano-caustic should be employed with greater caution than any other laryngo-surgical procedure, and only in the hands of a very skilful laryngologist.

At all events, all such cases are to be regarded as certain contraindications, where polypi are inserted on the vocal-cords, whether with a thin or thick peduncle, and in the next place, all growths with thick peduncles on the ventricular bands and ary-epiglottic folds; because here even the burning heat, acting only for six seconds, will cause injurious ulcerations on the neighboring parts.

There is, therefore, no reason why we should allow a very wide range for the use of the hot wire, because, where the slender knife does not appear to be indicated, the wire noose is manifestly adapted at least to assist the operative procedure.

On the other hand, the galvano-caustic is a very excellent, valuable means of destroying large growths that fill up the entire superior cavity of the larynx, since it forces its way into the growth without injuring the parts.

A cautious application of the galvano-caustic is also indicated where knobby, protuberant masses of tumor extend on to the walls of the larynx, or where there is considerable hypertrophy of the ventricular bands, in order that by the galvano-thermic effects, there may be produced, just at this point, a cicatricial retraction that in other cases would be fearful.

Perhaps, also, the momentary application of a galvano-cautery, terminating in as fine a point as possible, might be attempted when the formation of a surface of ulceration were desired (for example, in quite small fibroids that are not

removable by other methods), with the view of gradually destroying the remainder by subsequent cauterization with nitrate of silver or chromic acid.

The attempts that have been made to perform operations under the guidance of the laryngoscope, while the patient was narcotized by chloroform, have not thus far been successful.

The principal reason is, that on account of the lack of co-operation of the will of the patient, the opening of the mouth and stretching out of the tongue are not accomplished satisfactorily.

On the other hand, in attempts of this kind, we are justly fearful lest, through the protracted irritation, by instruments, of the larynx, and especially of the vocal cords, there may be caused a fatal attack of laryngo-spasms, since, indeed, it is well known that the general anesthesia caused by chloroform does not extend to the throat and larynx.

[Reference is here made to the author's method of operating on the larynx, after a previous tracheotomy under chloroform, contained in the Berlin Klinischen Wochenschrift, Jan. 1864.]

5. *Cauterization*.—So soon as a neoplasm gets into such a condition that the method of operation above described can not be employed in any way, or, as is most frequently the case, that the patient can not muster enough courage and perseverance to endure the inconveniences and pains of a protracted laryngoscopic procedure, it only remains to attempt to destroy the local disease by cauterization. This is, as a rule, less unpleasant and less frightful. Of course, it is to be employed only when an immediate removal of the growth is not indicated.

This procedure consists in the introduction of solid or fluid cauterizing substances into the cavity of the larynx, and thereby gradually diminishing the size of the new formations. It demands, usually, a considerable time. On this point we insist particularly, because those who are wanting in experience in this practice, easily give themselves up to the illusion that the whole procedure can be ended as quickly as the removal of papillomata on the tongue, or of warts on the hand, by means of a stick of nitrate of silver.

Cauterization yet more frequently serves for the removal and equalization of the rough surfaces that usually remain in the places of insertion after the use of cutting or crushing instruments for the removal of new formations.

(a) *Application of solid Cauterizing Agents.*—Nitrate of silver and chromic acid are the remedies that have, by experience, proved themselves to be the most suitable for the above indications, and least injurious to the neighboring parts of the healthy mucous membrane.

The simplest and cheapest cauterizer that I have used from the beginning, is an instrument quite similar to a sound (fig 35).

FIG. 35.

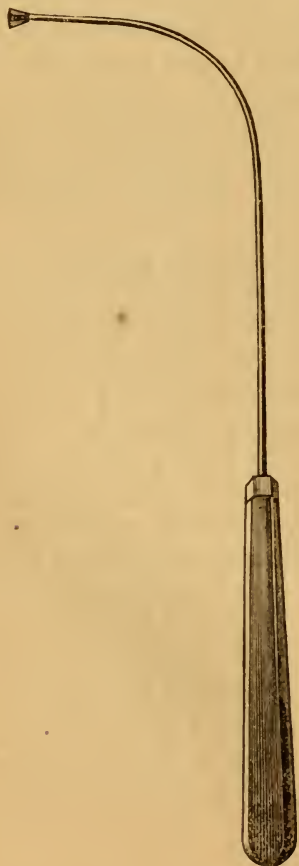
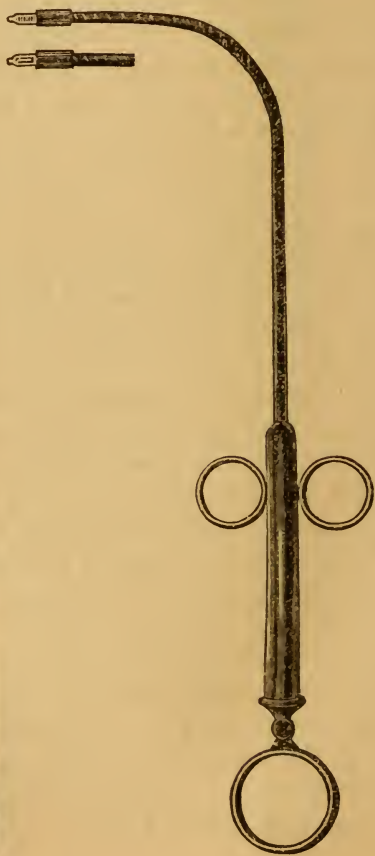


FIG. 36.



In order to use the nitrate of silver in substance, I employ a cauterizer, either covered or not, according to the capacity of the throat and larynx. It consists of wire or German silver, that on its inferior extremity has a knobby piece of platinum, in which are rough, file-shaped surfaces that receive the caustic according as one wishes to cauterize horizontally or perpendicularly.

The covered cauterizer (fig. 36.) consists of a cauterizing wire, and a sliding tube inclosing it. I have constructed my instrument like one recommended by Rauchfuss, with this difference only, that I have made the cauterizing portion flat, and broader, instead of round, in order to touch a somewhat larger space.

In this instrument, just as in the uncovered one, the part that serves for fastening on the nitrate of silver by melting, can be made of platinum. The flexible silver wire, and the covering, allow the instrument to make every necessary curve. The instrument is curved in this way: The warmed piece of platinum is dipped one or more times into melted nitrate of silver. After the silver is fastened on by melting, it is advisable to prove whether it adheres firmly enough by striking against the handle of the instrument.

In order that less preliminaries may be necessary, and that at the same time the effect may be energetic, I have recently made frequent use of the caustic in the ordinary form of a stick, covered with gauze, in cases where the space is sufficient (fig. 37). I place such a kind of stick, about an inch long, between the blades (one of which is made light and thin), which are excavated correspondingly in the shape of a trough, and are rough on the inner surface. These I attach to forceps, the handles of which can be closed, and allow the stick of nitrate of silver to project about three *millimetres*. The fear that the caustic will break to pieces is entirely ungrounded, since the blades of the forceps exercise a quite uniform but not too powerful pressure on the pencils that are covered with gauze.

For cauterization of the epiglottis I use a similar forceps, only provided with shorter and less curved blades.

Before using a cauterizer, it is advisable to practise and

FIG. 37.



FIG. 38.



train the larynx by means of an ordinary sound, since the touching of the parts with such kind of instruments is usually more sensibly felt than the application of a cutting knife.

Chromic acid demands more caution in its use, because it is more widely and more rapidly diffused in the cavity of the larynx.

In applying it I also use the covered cauterizer above mentioned. Into the sheath I shove a wire that has on its

inferior broad extremity an oblong four-angled groove or furrow. This cavity is first moistened a little, and then carefully filled with dry crystals of chromic acid, by means of a pincette. The sheath is then shoved down without allowing any crystals to adhere to the end of the instrument, in order to make use of the canterizer before the crystals melt.

The cauterizations in the larynx cause always a lively burning; sometimes, also, a severe pain that lasts for some time. Therefore, previous to cauterization, we have to remind the patient not to be unnecessarily anxious, or on that account to be averse to the treatment.

All the instruments that serve for the application of nitrate of silver, as well as of chromic acid, must be cleansed every time they are used by dipping the pieces, or their extremities, in water, and afterward carefully wiping them dry with a linen towel.

(b) *Application of fluid Cauterizing agents.*—Cauterizing substances in a fluid form are chiefly applied by means of a so-called touching sponge. Fine hair-pencils are less suitable. This treatment is usually employed days and weeks long, before laryngoscopic operations with cutting instruments are undertaken, in order to blunt the sensitiveness of the larynx, or to remove any inflammatory condition.

There are also cases and individual circumstances that will allow neither special instrumental procedures nor the application of solid caustics.

Under such circumstances, there only remains the touching with solutions of nitrate of silver. This is a very mild procedure, and, according to my experience hitherto, no patient opposes it, although it must be continued for months, in order to gain radical or often only partial results.

Touching with the solutions of nitrate of silver is indicated in superficial hypertrophy of the mucous membrane, in trivial growths on the mucous membrane, soft papillomata, soft, small fibromata, and also in cases where, after operations by cutting or by crushing, parts remain that cannot be removed.

I hold that a fine hair-pencil is not so suitable a holder for fluid cauterizing substances, because it contains too little fluid, and the application must, therefore, always be repeated over and over, to say nothing of the fact that the pencil, on its introduction, easily rubs against the walls that it must pass, and is deprived of its little contents before it reaches the spot designed.

We chiefly use, therefore, a touching sponge, an instrument of German-silver similar to a sound, and which has a needle's-eye on its extremity (fig 38). On this a good soft sponge (wash sponge) of the size of an acorn is firmly sewed.

I have used a sponge of this kind from the commencement of my laryngoscopic practice, and have found that it has been quite generally introduced.

The method that has been adopted here and there, of fastening the sponge in a metallic cover by means of a sliding ring as in the *porte crayon*, I do not regard as suitable, because the instrument thereby becomes larger and less flexible. The sponge also loses its uniform, oval form, and, finally, the sliding ring may easily give way, thereby affording too little certainty for the fastening of the sponge.

As a matter of experience, the healthy portions of the larynx, that are affected by the solutions at the same time, are in no way injured, even when the touchings are continued for a long time.

The applications should be made daily, or every other day, according to the judgment.

It is best to begin with solutions of nitrate of silver (3i. to $\bar{3}$ i. of water), and gradually advance to the strongest concentrations.

And here I cannot omit to mention that it is indeed quite possible to acquire such a facility in touching with the sponge, that one can touch the cavity of the larynx every time with certainty, without the direct guidance of the laryngeal mirror, if an image of its condition has been previously obtained by laryngoscopic examination. This, however, has been doubted by some.

According to my experience I would advise old people not to delay tracheotomy too long, and, especially, not to allow disturbances of respiration to exist for too great a period, since these gradually produce a congestive condition of the mucous membrane of the trachea, or quite a considerable dilatation of the vessels; and when it ultimately becomes necessary to open the trachea, there may extensive hemorrhage, and it may be impossible to prevent the blood from entering the smaller bronchial tubes.

As a result of this, bronchitis or pneumonia will be excited, and the issue may be serious.

Quite a number of the operations that depend on the laryngoscope can be undertaken with brilliant results by first establishing (if I may call it such) a temporary safety valve.

SUPPLEMENT.

EXTRA-LARYNGEAL METHODS OF OPERATION.

In the foregoing chapters we have treated of all the methods of operation that are possible under the laryngoscope. For the honor of laryngoscopy we would that we could affirm that, in the majority of the cases of polypus, the desired end could be attained by one or the other method, or through combination of them, even with the aid of tracheotomy. Yet, we must confess, that in spite of the value of laryngoscopy, impossibilities cannot be attained. In spite of perseverance on our part, as well as on the part of the patient, in spite of all technical skill, cases will yet remain that demand an extra-laryngeal operation. I refer to tracheotomy with the immediate or subsequent opening of the thyroid cartilage, in order the easier to extirpate polypi from the hidden folds of the larynx under the guidance of the reflecting mirror.

The indications for such a course as this are these—when, after tracheotomy has already been resorted to, yet the operative removal under the laryngoscope does not succeed; or when clumsy growths, or thick masses of tumor of considerable volume, cover the entire laryngeal aperture in such a way that the places of insertion are not perceptible. There are also cases where the patient earnestly desires to get rid of the canula in the throat, and to regain at least a tolerable voice for the remainder of his life.

For those exceptional cases of patients who can accustom themselves to wearing a canula, the contrivance suggested by

Burow, of a flapping valve, is recommended, in order that, at least, they may not be compelled to simply whisper.

The immediate opening of the thyroid cartilage without previous tracheotomy, has not, to my knowledge, been attempted as yet, for the extirpation of polypi. Indeed, laryngologists who are acquainted with the great irritability of the parts of the larynx would not regard such a procedure favorably, because even a momentary paroxysm of suffocation, in the midst of such an operation, would be a very unpleasant and disturbing complication.

Therefore, both for the life of the patient, and on account of the disturbing accidents, and the difficulties thereby increased in undertaking the division of the cartilage and extirpation of the tumor, we should precede the operation by making an artificial external opening below the vocal cords. And then the most that we can do is to take into consideration the propriety of an immediate opening of the thyroid cartilage, if the general health, the strength, and the psychical condition of the patient allows. At all events is this method, that has been used until now, to be preferred to first opening the thyroid cartilage some days or weeks later. Up to the present time, seven operations of this kind have been performed. They were collected by Binz, in No. 2 of the *Berlin Klinischen Wochenschrift*, 1865.

The fear of necrosis of the thyroid cartilage, formerly entertained, has not been substantiated. We have to exercise the greatest care in the division of the thyroid cartilage, in order not to cut into the vocal cords, as generally this operation must be performed with a painful anxiety, and with an avoidance of all haste.

It is most appropriate, in making the incision in the skin that serves for the tracheal opening, to extend it as far down as the protuberantia laryngea.

If the soft parts are well divided as far as the cartilage, and if the bleeding is fully stanchd, we apply a small hernia knife, that must have a straight, powerful blade, into the tracheal wound, and divide the thyroid cartilage as far down as the incisura-thyroidea, without allowing attacks of cough-

ing to interfere with the speedy and considerate performance of the incision.

Before we approach the protuberance of the thyroid cartilage, it is advisable, for the next step, to put the blunt end of a knife between the anterior glottis, which is inserted a little deeper (carefully observing a straight direction and position of the knife), in order by pressing the vocal cords apart to prevent them from being injured. For this purpose the back of the knife has an advantage, since it can penetrate to the sharp angle of union of the glottis, without cutting the border of the vocal cords.

Immediately after the complete division of the cartilage, we insert a surgical forceps with thin blades, and let an assistant hold the flaps of the cartilage widely apart, in order that, by means of a reflector, day or lamp-light, we may conveniently examine the growth, and reach it with instruments.

If the tumor be inserted on thin peduncles, it is enough to seize it with a hooked pincette, and take it out by pieces with a small knife or shears. The little blood that then pours forth is absorbed up by small sponges that we have in readiness fastened to forceps-like holders. If this be not done, the blood may flow down into the trachea and give rise to disturbing paroxysms of coughing.

If the tumor has a broad base, or if it be simply an overgrowth of the basement membrane, the disturbing hemorrhage can be diminished by removing it with a fine *écraseur* noose.

After the removal of the growth, and after immediate cauterization of the projecting portions of the mucous membrane, and of the inequalities, and the small portions of the tumor remaining, we at once close the laryngeal cavity again, and place adhesive plaster over the borders of the wound.

According to observations that have been made thus far, the surfaces of the cartilage heal together quite rapidly, and we can usually unite the tracheal opening in the course of a few days.

A second extra-laryngeal operative procedure is *laryngotomie sous-hyodienne*, according to Vidal and Malgaigne, and first employed by Prat.

He makes an incision in the skin, from two to three millimetres in length, parallel with the inferior border of the hyoid bone, forces his way quickly through the fascia, membrana hyothyroidea, to the epiglottis. He then seizes with a forceps the fibrous tumor situated on its external surface, and cuts it off with a curved shears. The wound heals rapidly, and the patient can breathe with perfect ease, and is also permanently relieved of his difficulty. According to Malgaigne, the epiglottis is to be drawn down to the wound with a forceps, in order to get a convenient view of the cavity of the larynx. Up to the present time, there has been no further experience with this method of operation.

Experiments that I have made on the dead body have convinced me that this procedure, although it promises many advantages, since it leaves the vocal cords intact, would be indicated only for the extirpation of tumors on the epiglottis, and at most on the superior and posterior divisions of the laryngeal cavity.

EDITOR'S APPENDIX.

IN the preparation of the Introduction, it was the aim of the Editor to present the various subjects there treated, in as brief, compact, and simple a manner as was consistent with the completeness of the work. For this reason, much that may be of interest to those specially concerned with laryngology, was intentionally omitted, because it was believed that a profusion of illustrations of the myriad forms of apparatus would serve to dishearten, rather than to encourage, the student or the general practitioner. Accordingly, a few additional cuts are here presented, with brief descriptions of their distinguishing features.

I have received a note from Dr. F. B. Lawson, of this city, containing a description of a *Caustic Applicator*, recently devised by himself, for the purpose of applying solutions of nitrate of silver, and other substances, to concealed mucous surfaces.

The instrument was chiefly designed for the mucous membrane of the uterus and urethra, but, as the inventor here states, it is just as well applicable to other concealed mucous surfaces. It can hardly be used, however, in making applications to the larynx, under the guidance of the laryngoscope, for reasons that will be obvious on reading the description accompanying the letter.

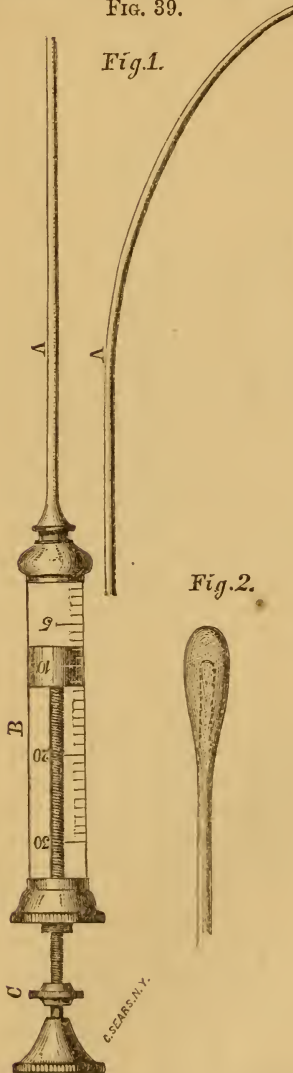
For making caustic applications directly to the orifices of the eustachian tubes, and to the pharynx and naso-pharyngeal space, it is in some respects superior to any other instrument I have yet seen. As the nozzle is flexible, it can readily be bent in the form of an eustachian catheter, whenever it may be desired.

I have several times made applications, by means of this instrument, directly to the faucial orifices of my own eustachian tubes.

“DEAR DOCTOR: 37 WEST 31st STREET, }
NEW YORK, November 1, 1867. }

“Agreeably to your request, I am glad to furnish you with a

FIG. 39.



LAWSON'S CAUSTIC APPLICATOR.

description of an instrument devised by myself, for applying caustic and astringent solutions to concealed mucous surfaces.

"By the usual methods we all have experienced many difficulties; exposed the patient to many dangers; and often failed in obtaining good results, simply because the surfaces were unevenly touched, too severely cauterized, or not cauterized at all. To obviate these difficulties, and to enable me to apply these preparations to the proper surfaces, I was induced to adopt this new method, and the results, so far as I have progressed, have been remarkably favorable. It gives me perfect command of the caustic, which can be used of any strength, and enables me to apply it thoroughly and evenly to any surface, to the pharynx; to the mucous membrane of the male and female urethra, and even to that of the uterus, which, by the usual methods, is frequently inaccessible, unless the parts are previously dilated.

"This instrument, which I have denominated a *caustic applicator*, has a *nozzle* (A), which is a conical, flexible silver or platinum tube, at its bulbous extremity of the size of a No. 2 bougie; at its base, of a No. 3; is $7\frac{1}{2}$ inches in length, and is attached to a glass syringe (B). The piston of this syringe works by means of a screw, through the nut (C), which is attached, or not, to the cap, as the operator may choose; but in other respects it is like the subcutaneous syringe, except that the metal below the plunger is pure silver.

"The steps necessary to prepare the instrument for use are these:

"1. The syringe is to be completely filled with whatever solution is required, and the liquid forced to the end of the tube.

"2. A piece of cotton, more or less, according to circumstances, is to be carefully and securely wound round the end of the nozzle, so as to form a bulb (see fig. 2), which must be thoroughly wet with warm water, immediately before being used.

"3. The nozzle is to be bent to suit the part on which the operation is to be performed.

"The cotton bulb is now applied to the part to be cauterized, and a quantity of fluid, sufficient to saturate it, is to be injected, when it can be used as a swab, and should be moved from within, outwards. The piston, at the time of injecting the cotton, should work through the nut (fig. 1, C) attached to the cap, and by observing this precaution, the operator, with a little experience, and with the assistance of the guage, can use whatever quantity of fluid he desires.

"This instrument possesses the following advantages:

"1. It permits of these applications being made to surfaces that are, for the most part, not readily accessible by the ordinary means.

"2. The nozzle being flexible, it is appropriate for *all* concealed mucous surfaces, and therefore does the work of many instruments.

"3. It applies clean caustic on a clean swab, and cauterizes the *precise spot affected*, thoroughly and evenly, and removes all the coagulable materials.

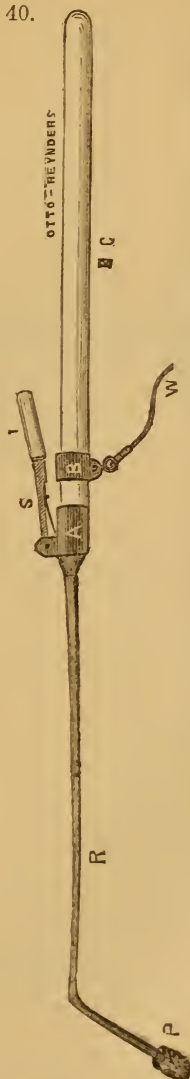
"I have used this instrument in the uterus, where I employ it fre-

quently, and for which organ it was originally intended; in cases of acute and chronic catarrh, etc., with or without erosions and ulcerations; in the male urethra, in cases of gonorrhœa and gleet; and in all, with ease, safety, and decided benefit.

Yours, most sincerely,

"F. B. LAWSON, M. D."

FIG. 40.



MACKENZIE'S LARYNGEAL GALVANIZER.

Fig. 40 represents Mackenzie's Laryngeal Galvanizer The

indications for its use have been already pointed out, and need not be repeated here.

“The operator should hold the laryngeal mirror with the left hand, and with the right introduce the laryngeal galvanizer below

FIG. 41.



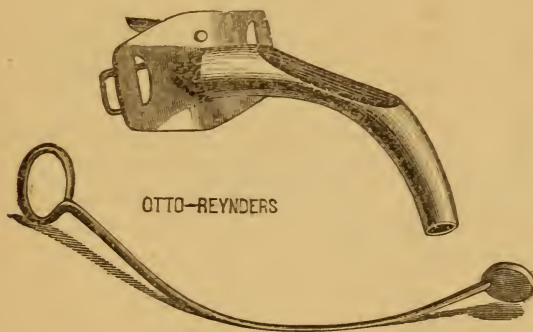
TOBOLD'S BRUSH.

the epiglottis. He now touches the spring on the upper part of the instrument with his index finger, and the current passes directly to the cords.

It can be seen that the current does not pass beyond the metal ring (B), till the operator touches the ivory handle (I), when the spring (S) connects the two rings (A and B), and the current then passes on to its destination. The irritation of a foreign body in the larynx causes the vocal cords to become tightly approximated, and thus renders it easy to touch their upper surfaces. By placing the point of the laryngeal galvanizer on the arytenoid cartilages, both branches of the pneumogastric may receive the electric impression."

Fig. 41 represents Tobold's Brush for making applications to the

FIG. 42.



TOBOLD'S CANULA AND SMALL MIRROR.

larynx. Instead of the brush, he prefers to have a sponge fastened to the end of the wire.

Fig. 42 represents Tobold's Canula and Small Mirror, for infraglottiscopy, after tracheotomy, as described in his "Lehrbuch."

Fig. 43 represents Lewin's Pulverisateur, for cold inhalations. It is quite convenient for office use, but more expensive than the forms of apparatus for inhalation previously represented.

"R. A glass receiver, into the metal top of which the air-pump is screwed. The inhaler is filled with the medicated solution by unscrewing the air-pump. Air is forced into the receiver by alternately depressing and raising the handle *h*, with the right hand, while a finger of the left hand is kept on the extremity of the jet-thrower, *j*.

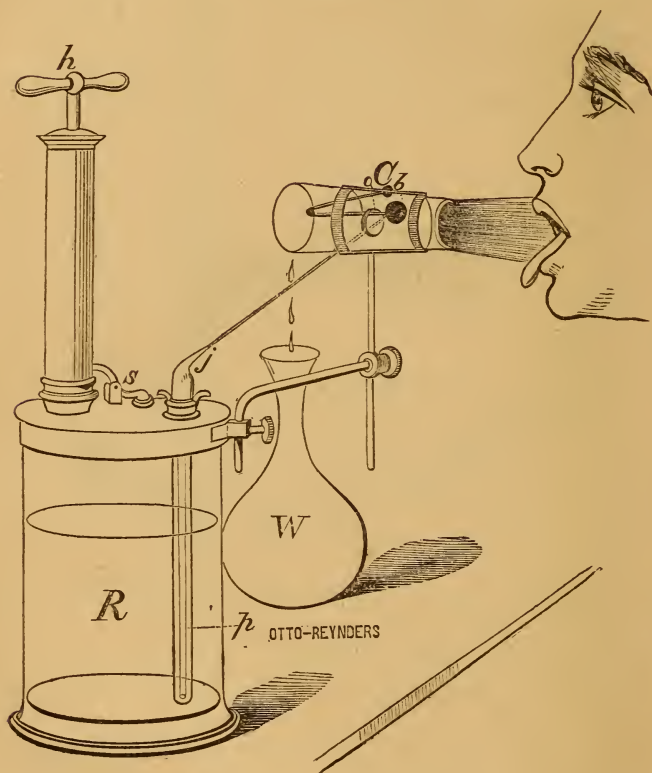
"p. A fine glass pipe, which reaches almost to the bottom of the receiver, and after passing through the lid is bent at an angle of about 130°. At its extremity is a fine opening.

"*j*. The jet-thrower, through which a very fine stream passes to the metal button *b*.

"*S*. Safety-valve.

"*C*. Glass cylinder for limiting the diffusion of the spray. It slants slightly,

FIG. 43.



LEWIN'S PULVERISATEUR. (After Mackenzie.)

so that the farther extremity is on rather a lower level than that near the mouth.

"*o*. Opening in cylinder, through which the jet of liquid passes to—

"*b*. A metal button, on which the jet breaks into a fine spray. A portion of the liquid forms drops, which run into—

"*W*. The waste-bottle.

"The patient's mouth should be placed close to the end of the cylinder, and the tongue protruded."

APPARATUS FOR THE GALVANIC CURRENT.

The want of a portable apparatus for generating a primary current of electricity, that shall be at once intense and uniform, has long been felt by all electricians, and is not yet fully met.

Stöhrer's large compound battery, composed of twenty-four or thirty-six cells, is a very excellent apparatus, but is not conveniently portable.

Dr. Wm. A. Hammond has devised a modification of the voltaic pile, that he has found very convenient and reliable. It is composed of plates of perforated zinc and copper (copper gauze). The elements are sufficiently separated from each other to allow of a free circulation of air. The electricity is generated by the action of vinegar, or diluted acetic acid, on the metals.

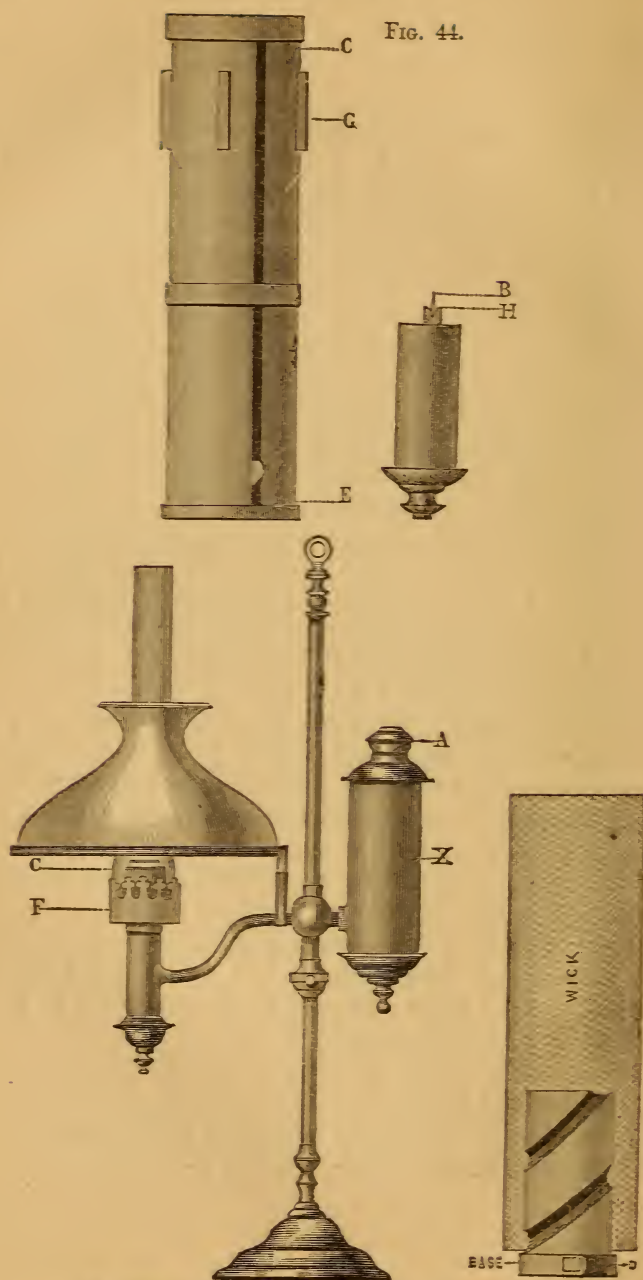
The advantage of this apparatus is, that it is quite portable. Its disadvantages, according to my experience, are, the rather unpleasant odor that arises from the pile while it is being acted on by the vinegar; but more especially the difficulty of arranging the plates, in the precise manner that is necessary, in order to secure an intense and uniform current. It is also necessary to wash it thoroughly each time that it is used.

Messrs. Chester & Co., 104 Centre-street, New York, the well-known and skilful manufacturers of electrical apparatus, are now constructing a compound battery for generating the primary current, that promises to be at once neat, convenient, constant, and tolerably portable. It is composed of a number of small cells, that are made perfectly water-tight. The elements are composed of carbon and zinc; and by inverting the apparatus, all the solution can be instantaneously removed from contact with them.

The lamp that I usually employ, and that I can decidedly recommend, is the "*Saint Germain, or German Study or Office Lamp*," (C. A. Kleemann's patent.)

This lamp will burn poor kerosene, but it is always advisable to procure the best and purest.

I append the cuts (fig. 44) and description kindly loaned to me by the New York agent, C. F. A. Hinrichs, 150 Broadway.



ST. GERMAIN, OR GERMAN STUDY OR OFFICE LAMP.

In order to use this lamp in making a laryngoscopic examination, it is only necessary to remove the porcelain shade, place over the chimney one of Tobold's brass tubes, with lenses (see fig. 1, Introduction), and attach a reflector.

This lamp gives a strong, steady, and brilliant light, and is, of course, well adapted for all the ordinary purposes of illumination. It emits neither smell nor smoke.

The whole apparatus should be securely fastened to the table by a clamp.

DIRECTIONS FOR USE.

"To fill the lamp, take out the holder (A), invert it, and pour in the oil, till it reaches the valve; then pull up the valve by means of the wire (B); then invert it, holding it above the holder (X), so that any oil which may escape drops into the holder; replace it in the holder (X) again. To put on the wick, take off the chimney-holder (F); take out the cylinder (C); take out the smaller cylinder (D); tie the wick at the base of cylinder (D), then replace the cylinder (D) in the large one (C), taking care to push it down as far as the point (E). Replace everything as before, the large cylinder (C) having the brass catches (G) up, and the ring (E) down."

ANATOMY OF THE SOFT PALATE, UVULA, AND PHARYNX.

The general anatomy of these parts, as it is usually described in our text-books, need not be repeated here in any detail. The points that particularly concern us, in the treatment of diseases of the pharynx uvula and posterior nares, are the mucous membrane and glands, the nervous and arterial distribution, and the action of the muscles; and, accordingly, I have compiled from Dr. Tobold's "*Lehrbuch der Laryngoscopie*," what seems to me to be of special and practical importance in the anatomy and functions of those parts.

The practical anatomy of the larynx will be found distributed through the present translation, under the appropriate sections.

ANATOMY OF THE SOFT PALATE.

1 The soft palate depends from the posterior border of the hard palate, as a wall of division between the cavity of the

mouth and the pharynx, and, in the median line, runs out into a conical-shaped projection called the uvula. This is divided by the soft palate into two halves. Two curved folds of mucous membrane, containing muscular fibres, arch outwards and downwards from the uvula on each side. These are called the arches or pillars of the soft palate. The anterior pillar runs outwards and downwards.

ACTIONS OF THE MUSCLES OF THE SOFT PALATE.

The azygos uvula permits the whole to curve up, and when there is extraordinary power of contraction it may allow it to diminish to a minimum. In catarrhal inflammation, not unfrequently a paralysis of the muscle arises, and consequently the uvula continually irritates the tip of the tongue.

The tensor veli palatini (or circumflex palati mollis, or speno-salpingo-staphylinus), extends the soft palate, not only in an oblique direction, but, also (according to Valsalva), opens and widens the eustachian tube.

The Levator veli palatini (Petro salpingo-staphylinus) raises the soft palate in such a way that its free border curves against the posterior wall of the pharynx, and makes a kind of septum between the pharynx and choanen.

The palato glossus (constrictor isthmi faucium) and its fellow operate as true sphincters, since they draw down the soft palate and extend the arcus palato glossus, and bring them near to each other.

The palato pharyngeus approximates the arcus pharyngo-palatini, and raises the pharynx and larynx.

GLANDS OF THE SOFT PALATE.

The soft palate is abundantly supplied with encysted and acinose glands. The acinose glands beneath the mucosa of the anterior side form quite a strong layer, which stands in intimate connection with the posterior portion of the hard palate.

On the anterior surface of the soft palate, these glands, ranging in size from a millet to a lentil, are readily perceptible. They secrete a gelatinous mucus. On the posterior side of the soft palate, as well as in the neighborhood of the tonsils, these glands exhibit a smaller structure, and also are not so closely crowded together. (Luschka.)

The glands are roundish, provided with small cavities lined with mucous membrane. In the thicker wall of these, which consists of fibullary connective tissue, are imbedded roundish follicles, similar to the solitary follicles of the intestines. These appear isolated on the palate, and on the posterior surface of the soft palate.

VESSELS OF THE SOFT PALATE.

The *arteria descendens*, the pterygo-palatina, a branch of the internal maxillary, descends through the pterygo-palatine canal, sends palatine branches, through the posterior canals, to the soft palate and the tonsils. It anastomoses with the ascending pharyngeal artery, and proceeds through the palatine foramen to the hard palate, on which, as the anterior palatine artery, it runs close by the alveolar process arterially, and passing through the *canalis incisivus*, anastomoses with the artery of the nasal septum.

The *arteria vidiane* rises from the origin of the descending palatine, more frequently, also, directly out of the maxillary, passes backward with the nerves of the same name through the vidian canal, ramifies in the upper portion of the pharynx, and anastomoses with the ascending pharyngeal artery.

The ascending palatine artery (pharyngo-palatina) rises from the origin of the external maxillary artery, sometimes also from the ascending pharyngeal, and ascends outward, close by the pharynx, between the stylo-glottis and stylo-pharyngeus. It supplies these muscles, the soft palate, the mucous membrane of the throat in the vicinity of the eustachian tube, and anastomoses in the soft palate with the descending palatine artery.

The *tonsillary artery* takes its origin on the inner side of the angle of the lower jaw, and ramifies on the lateral wall of the pharynx and tonsils.

Small branches also pass from the lingual and pharyngeal arteries to the soft palate.

Veins of the same name are continuous with those of the nasal mucous membrane and empty themselves into the internal maxillary plexus and the pharyngeal veins.

The *lymphatic vessels*, like the veins, are diffused in greater numbers beneath the mucous membrane, and are continuous with those of the roots of the tongue and nasal mucous membrane.

NERVES OF THE SOFT PALATE.

The palate, with its movable as well as sensitive soft palate, has four sources of nerve supply. The motor-nerves come from the *fifth*, the *vagus*, *glosso-pharyngeal*, and the *facial*; the *sensitive*, as lesser palatine nerves, from the second branch of the *fifth*.

The internal pterygoid gives branches to the tensor veli palatini and terminates in the pterygoid muscle.

The pharyngeal branches of the *vagus* innervate the *azygos uvulae*, the levator veli palatini, and the pharyngo-palatini muscles.

The *glosso-pharyngeus* supplies the glosso-palatine muscle, and the facial the soft palate.

Hence it is that in facial paralysis of a central origin deviation of the soft palate is frequently observed.

The *internal and external lesser palatine nerves* of sensation, arising from the superior maxillary branch of the trigeminus, pass through the palatine foramen and ramify on the palate, the inner branch on the uvula and the middle portion of the soft palate, the external branch on the outer portions and on the tonsils.

Some sensitive fibres also proceed from the *vagus*, and the glosso-pharyngeal.

ANATOMY OF THE PHARYNX.

The soft palate lying on the posterior wall of the pharynx, in swallowing, singing, and speaking, divides it into two cavities—the *cavum pharyngo-nasale* that contains the *choanen*, and the greater *cavum pharyngo-laryngum*, with the isthmus and the entrance to the cavity of the larynx. Luschka also distinguishes the *cavum pharyngo-orale*.

The muscular structure of the pharynx consists of two groups of muscles of greater or less thickness, which contract towards the median line. The object of these muscles is to move the particles of food successively into the œsophagus during the act of swallowing.

The muscular structure of the pharynx consists of

(A.) *Layer of circular fibres.*

1. Constrictor pharyngus superior.
2. Constrictor pharyngus medius.
3. Constrictor pharyngus inferior.

(B.) *Layer of longitudinal fibres.*

The muscles included under this head raise the pharynx and widen it obliquely.

4. Stylo-pharyngeus.

5. Azygos pharyngis.

6. Salpingo-pharyngis.

Both of the latter are sometimes wanting.

While the CONSTRUCTOR PHARYNGIS contracts the pharynx by drawing its posterior wall forward against the soft palate and the roots of the tongue, and cause that which has been swallowed to glide smoothly down, the STYLO-PHARYNGEI raise the pharynx, dilate it obliquely, and render it easy for the food to enter it.

MUCOUS MEMBRANE AND GLANDS OF THE PHARYNX.

The *mucosa pharyngis*, somewhat paler than that of the cavity of the mouth, is directly and uninterruptedly continuous with the mucous membrane of the cavity of the nose and mouth, the larynx, the œsophagus, the eustachian tube, and the middle ear.

In the purely respiratory portion of the pharynx in the *cavum pharyngo-nasale*, also in the arch of the pharynx, in the vicinity of the choanen and the orifices of the eustachian tubes, and on the posterior surface of the soft palate, there is ciliated epithelium.

The mucous membrane of the pharynx is quite liberally supplied with the acinose mucous glands, while the encysted glands are found but rarely.

The mucous glands, varying in size between a lentil and a pea, present quite a strong layer, especially on the superior extremity of the posterior and lateral wall of the pharynx. They gradually diminish anteriorly, and if they are affected with catarrhal inflammation, they are here observed as red prominences. In the sub-mucous tissue, over the arytenoid muscles, the number of these glands again increases. The simple and conglomerated glands, such as form the tonsils, and are also found on the roots of the tongue, occur in the vicinity of the choanen, the orifices of the eustachian tubes, and on the posterior side of the pillars of the soft palate.

BLOOD-VESSELS OF THE PHARYNX.

The principal artery is the *ascending pharyngeal*, that takes its origin on the same height with the lingual, from the inner side of

the external carotid. It allows many pharyngeal branches to enter the tissue of the lateral wall of the pharynx, since it ascends in a straight direction between the external and internal carotid, then ascends outward, between the latter and the lateral wall of the pharynx. The *pharyngea supremea* runs backward through the canaliculus pharyngeus on the roots of the *lamina pterygoidea interna*, ramifies in the upper wall of the pharynx, the eustachian tube, and the cavity of the sphenoid bone, and anastomoses with the pharyngeal ascending artery.

In the *plexus pharyngeus* varicosities are not unfrequently observed, and even phleboliths which, without doubt, may give rise to difficulties of swallowing.

On a level with the third cervical vertebra, there are found a very great number of lymphatic glands.

NERVES OF THE PHARYNX.

Five nerves give branches to the wall of the pharynx—the *glosso-pharyngeus*, *vagus*, *accessory*, *sympathetic*, and *trigeminus*. These, together, form the *plexus nervosus pharyngeus*.

The sensitive fibres arise from the second branch of the trigeminus.

The *motor nerves* arise from the glosso-pharyngus, which gives off pharyngeal and stylo-pharyngeal branches to the constrictors and to the accessorius Willisii. The inner branch of this, in close union with the vagus, supplies numerous elements to the constrictors through the pharyngeal branches of the vagus.

The sympathetic nerves arise from the inferior section of the *ganglion cervicale supremum*, which gives off from two to four branches from its anterior and inner periphery, and supplies interiorly and anteriorly the lateral wall of the pharynx, after it has previously united with the branches of the glosso-pharyngeus, and vagus of the same name.

INDEX.

	PAGE
ABSCESS OF THE LARYNX.....	150
Symptoms and Course.....	151
Etiology.....	151
Laryngoscopic Diagnosis, Prognosis, and Therapeutics.....	152
Alum with Glycerine in Rhinitis.....	46
Anæmia treated by General Electrization.....	166
“ of the Mucous Membrane of the Larynx.....	122
Anæsthesia of the Larynx....	164
Anatomy of Nasal Passages.....	43
“ Larynx	79
“ and Physiology of Nerves of Larynx.....	177
Anomalies in the Shape of the Larynx.....	194
Apparatus for Illumination (Tobold's).....	6, 8
“ Arrangement of, in Laryngoscopy.....	12
Application of Remedies under Laryngeal Mirror.....	25, 233
Ary-epiglottic Ligaments or Folds, Inflammation of.....	115
Arytenoid Cartilages, normal Color and Appearance of.....	27
“ “ Inflammation of.....	119
Atomizer Pump.....	55
“ Laryngeal.....	57
Avery, of London.....	3, 29
Babbington, Benjamin Guy.....	2
Bell, Charles.....	104
Belloc.....	104
Baumès of Lyons.....	2, 29
Bennati of Paris.....	2
Bergson.....	53
Bleorrhœa.....	35
Bozzini.....	1, 29
Canula (Tobold's).....	261
Catarrh—inappropriate term.....	39
Cauterization of Neoplasms.....	247
Chondritis.....	155
Chlorate of Potash, a Cleanser in Rhinitis.....	44
Clergymen's Sore Throat.....	100

	PAGE
Cohen, Dr., Mouth Distender of.....	17
Coughs, spasmodic and nervous.....	163, 164
Current of Electricity—constant in Paralysis.....	191
Cutting to Pieces—Method of operation.....	235
Czermak.....	3, 4
Duchenne.....	62
ELECTRIZATION.....	62
“ General Tonic Effects of.....	62
“ Apparatus for.....	63
“ Partial.....	67
“ Localized.....	69
“ of Larynx.....	190, 191
Elsberg, Dr., Palate Hook of.....	32
Emetics in Perichondritis.....	161
Epiglottis, interferes with Laryngoscopic Examination.....	17
“ Position and Appearance of.....	21
“ Inflammation of.....	113
“ Holding of in Operations.....	233
Examiner, Position of in Laryngoscopy.....	13
Examination, Laryngoscopic, method of conducting.....	12
“ Rhinoscopic, method of conducting.....	3, 2
Extirpation of Neoplasms.....	235
“ “ “ by a Noose.....	243
FOREIGN BODIES IN THE LARYNX.....	196
Anatomico-Pathological Appearance.....	196
Symptoms and Course.....	197
Effect of Imagination.....	199
Etiology.....	200
Physiology of Swallowing.....	200
“Swallowing the wrong way”.....	201
Diagnosis.....	201
Prognosis.....	202
Therapeutics.....	202
Tracheotomy.....	203
Use of Forceps for Extraction.....	204
Galvano-Caustic, Garcia.....	245
Prof. Manuel.....	63
General Electrization, Tonic Effects of.....	62
“ “ Effects of in Anæmia of Larynx.....	166
Gerhardt.....	passim.
German Student Lamp.....	9, 266
Glottidis Spasmus.....	164
Glycerine in Rhinitis.....	46
Green, Dr.....	104

	PAGE
Histology of Larynx.....	79
Holder, Laryngeal, with Brush and Sponge.....	24
Hot Drinks Cause of Rhinitis.....	38
" " Laryngitis.....	94
Hyperæsthesia of the Larynx.....	163
Imagination, Influence of, after Irritation of Foreign Bodies.....	199
Inhalations in Rhinitis.....	47
" Apparatus for.....	52
" Doses of Substances used in.....	58
" the Therapeutical Value of.....	59
" in Laryngitis Tuberculosa.....	131
Instruments for Operations in the Larynx.....	237, 250
Image in the Laryngeal Mirror.....	20
Iodine with Glycerine in Rhinitis.....	46
Kidder, Jerome, Electro-magnetic Machine.....	63
Knight, Dr. F. I., Case of, reported.....	192
Kolliker.....	passim.
Lamina intermedia.....	80
LARYNGITIS CHRONICA SIMPLEX, Anatomico-Pathological Appearance,	90
Symptoms and Course.....	92
Etiology.....	94
Laryngoscopic Diagnosis.....	95
Prognosis.....	97
Therapeutics.....	98
General Dietetic Management.....	99
Medical Treatment.....	101
LARYNGITIS, CHRONIC ULCERATIVE.....	109
Anatomico-Pathological Appearance.....	109
Symptoms and Course.....	110
Etiology.....	111
Laryngoscopic Diagnosis.....	111
Prognosis.....	112
Therapeutics.....	113
LARYNGITIS TUBERCULOSA; OR PHTHISIS LARYNGEALIS.....	120
Anatomico-Pathological Appearance.....	120
Symptoms and Course.....	122
Etiology.....	124
Laryngoscopic Diagnosis.....	126
Prognosis.....	127
Therapeutics.....	130
LARYNGITIS SYPHILITICA SIMPLEX ET ULCEROSA.....	132
Anatomico-Pathological Appearance.....	132
Symptoms and Course.....	133
Etiology.....	134

	PAGE
Laryngoscopic Diagnosis.....	135
Prognosis.....	137
Therapeutics.....	137
LARYNGOSCOPIC OPERATIONS—Preliminary Conditions and Require- ments.....	227
Phantom for Practice.....	229
Instrumental Apparatus.....	230
Special Preparations.....	231
Laryngoscopic Position.....	15, 232
Larynx, Mucous Membrane and Glands of.....	81
“ Cartilages and Ligaments of.....	79
“ Nerves of.....	166, 178
“ Anomalies in the Shape of.....	194
“ Foreign Bodies in.....	196
“ Neoplasms in.....	205
Laryngoscopy, History of.....	1
“ Apparatus for.....	5
Laryngoscopic Diagnosis, Exact, Suggestions for.....	75
Lawson, Dr. F. B., Caustic Applicator of.....	259
Levret.....	1
Light, Adaptation of.....	14
Light Concentrator of Mackenzie.....	9
Liston.....	3
Luschka.....	passim.
Mackenzie, Light-Concentrator of.....	9
“ Laryngeal Galvanizer of.....	261
Maculæ Flavæ.....	82
Middledorp, Labors of with Galvano-Caustic.....	245
Mirrors, Laryngeal.....	10
Mirror, Introduction of.....	15
Mirrors, Rhinal.....	29
Morphine, sub-cutaneous Injection of.....	166
Mucous Membrane, Diseases of.....	88
Nares, Posterior, Image of in Rhinal Mirror.....	33
“ Anatomy of.....	43
NEOPLASMS IN THE LARYNX.....	205
Anatomico-Pathological Appearance.....	205
Varieties.....	205
Papillary Tumors.....	207
Epithelial Cancer.....	210
Medullary Cancer.....	210
Mucous Polypi.....	211
Fatty Tumors, Lipomata.....	211
Symptoms and Course.....	212

	PAGE
Etiology.....	216
Diagnosis.....	217
Prognosis.....	224
Therapeutics.....	226
NERVES OF LARYNX, Diseases of.....	163
" SENSATION, Spasmodic Coughs and Nervous Pains in.....	163
Therapeutics.....	165
NERVES OF MOTION.....	166
Spasmus Glottidis.....	166
Symptoms and Course.....	168
Etiology.....	170
Diagnosis.....	173
Prognosis.....	172
Therapeutics.....	174
Neudörfer, Dr.....	27
Night Air, Exposure to, a Cause of Rhinitis.....	38
Nitrate of Silver, in Rhinitis.....	46
" " in Chronic Laryngitis.....	106, 107
" " for Cauterization of Neoplasms.....	249
Nomenclature of Diseases of Larynx.....	89
ŒDEMA OF THE LARYNX.....	138
Anatomico-Pathological Appearance.....	140
Symptoms and Course.....	141
Etiology.....	143
General Diagnosis.....	144
Laryngoscopic Diagnosis.....	145
Prognosis.....	147
Therapeutics.....	148
Œzena, Treatment of.....	51
Operations in the Larynx, Preparations for.....	231
" " " Special Methods of.....	235
" " " Instruments for.....	237, 250
" " " Extra-Laryngeal.....	254
PARALYSIS OF THE MUSCLES OF THE GLOTTIS.....	177
Symptoms and Course.....	181
Laryngoscopic Diagnosis.....	184
<i>Five Forms of</i>	186
Prognosis and Therapeutics.....	189
Electrization in.....	190, 191
Palate Hook.....	31
Patient, Position of in a Laryngoscopic Examination.....	13
Pharynx, Irritability of, how treated.....	17
" Anatomy of.....	270
Pharyngitis, how treated.....	50
Potash, Chlorate of, in Rhinitis.....	44

	PAGE
Physiology of the Voice.....	83
PERICHONDritis.....	155
Anatomico-Pathological Appearance.....	155
Symptoms and Course.....	156
Etiology.....	158
Diagnosis.....	159
Therapeutics.....	161
Polypi of Larynx, Removal of.....	237
Polypoid Growths in Nasal Passages	51
Position, Laryngoscopic.....	15, 232
Potash, Permanganate of, in Rhinitis.....	45
Puncturing.....	235
RHINITIS, Nomenclature.....	35
" Frequency of.....	36
Causes of.....	37
Symptoms of.....	38
Prognosis.....	41
Treatment of.....	42
Rhinoscopy.....	29
Rockwell, Dr. A. D.....	62
Roosa, Dr.....	45
Tar-water in Rhinitis.....	45
Tannic Acid with Glycerine, in Rhinitis.....	46
" in Laryngitis.....	106
Thudicum's (or Weber's) Method.....	47
Tongue, holding the.....	14
Tonsils Enlarged, interfere with Examination.....	17
Touching the Larynx.....	103, 131
Tracheotomy in Abscess of the Larynx.....	153
" Method of performing.....	254
Trousseau.....	104
Türk, Professor.....	3
Santorini, Tubercles of.....	21
Sales, Girons.....	52
Scarification of Larynx, how performed.....	149
" of Gums, in Spasmus Glottidis.....	175
Siegle.....	53
Siegle-Bergson's Apparatus for Inhalation.....	54
Smoking, a Cause of Rhinitis.....	38
" Effects of on Laryngitis.....	100
Senn, of Geneva	2
Spatula, Tobold's.....	30
" Türk's.....	30
" Cohen's.....	31

	PAGE
Sponge for Cauterization described.....	252
Spray Producer, Maunder's.....	56
Sugar Refineries, Air of, beneficial.....	130
Syringe, Laryngeal.....	24
" Posterior Nasal.....	44
Uvula Elongated, interferes with Laryngoscopic Examination.....	18
Uterus, often the Seat of Disease in Spasmus Glottidis.....	176
Vagus, Impairment in Conducting Power of.....	183
Vocal Cords, Color and Appearance of.....	21
" Inflammation of.....	116
" Anatomy of.....	80, 82
Voltolini.....	27
Von Bruns.....	27
Ventricular Bands, Inflammation of.....	115
Wall of the Larynx, Posterior, Inflammation of.....	118
Warden, A.....	3
Wertheim, Dr.....	27
Wrisberg, Tubercles of.....	21



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